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ENERGY National Renewable Energy Laboratory ePubs Update



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Basic Sciences

Beard, M.C.; Turner, G.M.; Murphy, J.E.; Micic, O.I.; Hanna, M.C.; Nozik, A.J.; Schmittenmaer, C.A. **Electronic Coupling in InP Nanoparticle Arrays.** *Nano Letters*. 2003; 3(12): pp. 1695-1699.

Blackburn, J.L.; Selmarten, D.C.; Nozik, A.J. **Electron Transfer Dynamics in Quantum Dot/Titanium Dioxide Composites Formed by in Situ Chemical Bath Deposition.** *Journal of Physical Chemistry B*. 2003; 107(51): pp. 14154-14157.

Curtis, C.J.; Miedaner, A.; Raebiger, J.W.; DuBois, D.L. **Periodic Trends in Metal Hydride Donor Thermodynamics: Measurement and Comparison of the Hydride Donor Abilities of the Series $\text{HM}(\text{PNP})_2^+$ ($\text{M} = \text{Ni}, \text{Pd}, \text{Pt}$; $\text{PNP} = \text{Et}_2\text{PCH}_2\text{N}(\text{Me})\text{CH}_2\text{PEt}_2$).** *Organometallics*. 2 February 2004; 23: pp. 511-516.

Gregg, B.A. **Chapter 18. Excitonic Solar Cells: The Physics and Chemistry of Organic-Based Photovoltaics.** Lieberman, M., ed. *Molecules as Components of Electronic Devices*. ACS Symposium Series 844. Washington, DC: American Chemical Society, 2003; pp. 243-257.

Liu, P.; Lee, S.H.; Tracy, E.C.; Turner, J.A. **Mesoporous Vanadium Oxide as Cathodes for Lithium Batteries.** Nazri, G.A., et al., eds. *Advanced Batteries and Super Capacitors: Proceedings of the International Symposium of the Electrochemical Society and the International Society for Electrochemistry, Fall 2001, San Francisco, California*. Electrochemical Society Proceedings Volume 2001-21. Pennington, NJ: Electrochemical Society, 2003; pp. 183-187.

Merida, W.; Maness, P.C.; Brown, R.C.; Levin, D.B. **Enhanced Hydrogen Production from Indirectly Heated, Gasified Biomass, and Removal of Carbon Gas Emissions Using a Novel Biological Gas Reformer.** *International Journal of Hydrogen Energy*. March 2004; 29(3): pp. 283-290.

Ozkan, E.; Lee, S.H.; Tracy, C.E.; Pitts, J.R.; Deb, S.K. **Comparison of Electrochromic Amorphous and Crystalline Tungsten Oxide Films.** *Solar Energy Materials and Solar Cells*. 30 September 2003; 79(4): pp. 439-448.

Pitts, J.R. **IME-5 Guest Editor's Foreword.** Pitts, J.R., ed. *Solid State Ionics*. Fifth International Meeting on Electrochromism (IME-5), 5-9 August 2002, Golden, Colorado. December 2003; 165(1-4): pp. xi-xii.

Yan, Y.; Liu, P.; Wen, J.G.; To, B.; Al-Jassim, M.M. **In-Situ Formation of ZnO Nanobelts and Metallic Zn Nanobelts and Nanodisks.** *Journal of Physical Chemistry B*. 2003; 107: pp. 9701-9704.

Zayim, E.O.; Liu, P.; Lee, S.H.; Tracy, C.E.; Turner, J.A.; Pitts, J.R.; Deb, S.K. **Mesoporous Sol-Gel WO₃ Thin Films via Poly(styrene-co-allyl-alcohol) Copolymer Templates.** Pitts, J.R., ed. *Solid State Ionics*. Fifth International Meeting on Electrochromism (IME-5), 5-9 August 2002, Golden, Colorado. December 2003; 165(1-4): pp. 65-72.

Bioenergy

[25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts.](#) 2003; 224 pp. NREL/BK-510-33708.

[Biomass Rapid Analysis Network \(BRAN\).](#) October 2003; 2 pp. NREL/FS-510-34724.

[DOE Thermochemical Users Facility: A Proving Ground for Biomass Technology \(Revised\).](#) Biomass Program (Fact Sheet). November 2003; 4 pp. DOE/GO-102003-1783.

[La energia geotermica en la actualidad: Geothermal Today \(Spanish version\).](#) September 2003; 8pp. DOE/GO-102003-1788.

[National Bioenergy Center: Laying the Foundation for Biorefineries.](#) November 2003; 4 pp. DOE/GO-102003-1782.

[NREL Bioprocessing Pilot Plant: Available for Industrial Use \(Revised\).](#) Biomass Program (Fact Sheet). November 2003; 2 pp. DOE/GO-102003-1784.

Agblevor, F.A.; Fu, J.; Hames, B.; McMillan, J.D. **Identification of Microbial Inhibitory Functional Groups in Corn Stover Hydrolysate by ¹³C NMR Spectroscopy.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708).* Golden, CO: National Renewable Energy Laboratory, 2003; p. 11.

Altintas, M.; Eddy, C.; Zhang, M.; McMillan, J.; Kompala, D.S. **Kinetic Modeling to Investigate the Interactions of the Engineered Pentose Pathway with the Glycolytic (ED) Pathway in *Zymomonas mobilis*.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708).* Golden, CO: National Renewable Energy Laboratory, 2003; p. 77.

Altintas, M.M.; Davis, M.; Eddy, C.; Zhang, M.; McMillan, J.D.; Kompala, D.S. **³¹P Nuclear Magnetic Resonance Studies of Sugar Metabolism in *Zymomonas mobilis*.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708).* Golden, CO: National Renewable Energy Laboratory, 2003; p. 78.

Brown, A.L.; Hames, B.R.; Daily, J.W.; Dayton, D.C. **Chemical Analysis of Solids and Pyrolytic Vapors from Wildland Trees.** *Energy and Fuels.* July 2003; 17(4): pp. 1022-1027.

Chou, Y.C.; Adney, W.S.; Decker, S.R.; Baker, J.O.; Himmel, M.E. **Heterologous Expression, Purification, and Characterization of a Cellobiohydrolase from *Penicillium funiculosum***. 25th *Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 51.

Chou, Y.C.; Decker, S.R.; Baker, J.O.; Himmel, M.E. **Heterologous Expression, Purification, and Characterization of the Glycosyl Hydrolase Family 7 Cellobiohydrolases from *Trichoderma reesei* and *Penicillium funiculosum***. (Abstract 6-CELL). *American Chemical Society. Abstracts of Papers: 225th ACS National Meeting, 23-27 March 2003, New Orleans, Louisiana*. Washington, DC: American Chemical Society, 2003; 1 p.

Chum, H.L.; Overend, R.P. **Chapter 3: Biomass and Bioenergy in the United States**. Goswami, D.Y., ed. *Advances in Solar Energy: An Annual Review of Research and Development, Volume 15*. Boulder, CO: American Solar Energy Society, Inc. (ASES), 2003; pp. 83-148.

Dale, B.E.; Elander, R.T.; Holtzapple, M.; Ladisch, M.R.; Lee, Y.; Eggeman, T.; Wyman, C.E. **Comparative Data from Application of Leading Pretreatment Technologies to Corn Stover**. 25th *Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 20.

Decker, S.R.; Gidh, A.; Himmel, M.E.; Vinzant, T.B. **Effect of Lignin Modifying Enzymes on the Molecular Weight Distribution of Kraft Lignin**. 25th *Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 52.

Ding, S.Y.; Jones, M.; Tucker, M.P.; Nedeljkovic, J.M.; Wall, J.; Simon, M.N.; Rumbles, G.; Himmel, M.E. **Quantum Dot Molecules Assembled with Genetically Engineered Proteins**. *Nano Letters*. 2003; 3(11): pp. 1581-1585.

Ding, S.Y.; Lamed, R.; Bayer, E.A.; Himmel, M.A. **Bacterial Scaffoldin: Structure, Function and Potential Applications in the Nanosciences**. *Genetic Engineering*. 2003; 25: pp. 209-225.

Ding, S.Y.; Rumbles, G.; Jones, M.; Tucker, M.P.; Nedeljkovic, J.; Wall, J.; Himmel, M.E. **Quantum Dots Stabilized by Genetically Engineered Proteins**. Thomas, J.L.; Kiick, K.L., and Gower, L.A., eds. *Materials Inspired by Biology: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 774. Warrendale, PA: Materials Research Society (MRS), 2003; pp. 165-170.

Eddy, C.; Altintas, M.; Kompala, D.S.; McMillan, J.D.; Zhang, M. **Measurement of Xylose Transport in Xylose-Fermenting *Zymomonas mobilis***. 25th *Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 79.

Graf, A. [State-Level Workshops on Ethanol for Transportation: Final Report](#). January 2004; 41 pp. Work performed by BBI International, Cotopaxi, Colorado. Appendix E available online only. NREL/SR-510-35212.

Jarvis, E.E.; Adney, W.S.; Decker, S.R.; Baker, J.O.; Himmel, M.E. **Increased Thermal Tolerance of *T. fusca* β -Glucosidase via Directed Evolution**. 25th *Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 57.

Johnson, D.K. **Effects of Dilute Acid Hydrolyzate Components on Glucose Degradation**. 25th *Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 164.

Johnson, D.K. **Methods for Quantitative Analysis of Uronic Acids in Biomass**. 25th *Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 164.

Kaminsky, J. [Development Strategies for Deployment of Biomass Resources in the Production of Biomass Power: November 6, 2001—February 28, 2003](#). January 2004; 88 pp. Work performed by Jacob Kaminsky, Columbia, Maryland. NREL/SR-510-33524.

Lasure, L.L.; Zhang, M. **Bioconversion and Biorefineries of the Future**. Rosenberg, N.J., et al., eds. *Applications of Biotechnology to Mitigation of Greenhouse Warming: Proceedings of the St. Michaels Workshop, April 2003, Saint Michaels, Maryland*. Columbus, OH: Battelle Press, 2004; pp. 95-109.

Maness, P.C.; Vanzin, G.; Huang, J.; Tek, V.; Smolinski, S. **Biological Water-Gas Shift Reaction in the Photosynthetic Bacterium *Rubrivivax gelatinosus***. 25th *Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 72.

Mann, M.; Spath, P. [Life Cycle Assessment of Renewable Hydrogen Production via Wind/Electrolysis: Milestone Completion Report](#). February 2004; 13 pp. NREL/MP-560-35404.

Marano, J.J.; Jechura, J.L. **Biorefinery Optimization Tools—Development and Validation**. 25th *Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 104.

Metting, F.B.; Scott, M.J.; Benemann, J.; Greenbaum, E.; Seibert, M.; Spormann, A.; Yukawa, H.; Houghton, J. **Microbial and Enzyme Biotechnology: 21st Century Opportunities for Greenhouse Gas Mitigation**. Rosenberg, N.J., et al., eds. *Applications of Biotechnology to Mitigation of Greenhouse Warming: Proceedings of the St. Michaels Workshop, April 2003, Saint Michaels, Maryland*. Columbus, OH: Battelle Press, 2004; pp. 115-136.

Mohagheghi, A.; Dowe, N.; Schell, D.; Chou, Y.C.; Eddy, C.; Zhang, M. **Evaluation of Newly Developed Integrants of Recombinant *Zymomonas mobilis* for Ethanol Production Process with Corn Stover Hydrolysate.** 25th *Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 83.

Mohagheghi, A.; Dowe, N.; Schell, D.; Chou, Y.C.; Eddy, C.; Zhang, M. **Performance of a Newly Developed Integrant of *Zymomonas mobilis* for Ethanol Production on Corn Stover Hydrolysate.** *Biotechnology Letters*. February 2004; 26(4): pp. 321-325.

Montague, L. [Lignin Process Design Confirmation and Capitol Cost Evaluation: Report 42002/02—Review of Design.](#) October 2003; 23 pp. Work performed by Harris Group, Inc., Seattle, Washington. NREL/SR-510-31579.

Nagle, N.; Tucker, M.P.; Dien, B.; Hicks, K.; Nguyen, Q. **Potential to Improve Dry Mill Economics by Increasing Ethanol Yield from Corn Fiber Residue.** 25th *Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 20.

Nguyen, Q.A.; Keller, F.A.; Tucker, M.P. **Ethanol Production with Dilute Acid Hydrolysis Using Partially Dried Lignocellulosics.** U.S. Patent No. 6,660,506 B2. 9 December 2003; 10 pp. Assignee: Midwest Research Institute, Kansas City, Missouri.

Nimlos, M.; Brooking, E.; Looker, M.J.; Evans, R.J. **Biomass Torrefaction Studies with a Molecular Beam Mass Spectrometer.** (Abstract 44-FUEL). *American Chemical Society. Abstracts of Papers: 226th ACS National Meeting, 7-11 September 2003, New York, New York*. Washington, DC: American Chemical Society, 2003; 1 p.

Nimlos, M.; Moens, L.; Looker, M.; Evans, R. **Comparison of the Maillard Reactivity of Amino Acids Using Pyrolysis-Molecular Beam Mass Spectrometry.** (Abstract 40-FUEL). *American Chemical Society. Abstracts of Papers: 226th ACS National Meeting, 7-11 September 2003, New York, New York*. Washington, DC: American Chemical Society, 2003; 1 p.

Overend, R. **Biomass Resources to Support a Low Carbon Future.** (Abstract 42-FUEL). *American Chemical Society. Abstracts of Papers: 226th ACS National Meeting, 7-11 September 2003, New York, New York*. Washington, DC: American Chemical Society, 2003; 2 p.

Pettersson, P.O.; Torget, R.W.; Jennings, E.W.; Eklund, R. **Softwood Hydrolysis in a Shrinking Bed Flow-Through Reactor.** 25th *Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 152.

Reddy, R.G.; Zhang, Z.; Arenas, M.F.; Blake, D.M. **Thermal Stability and Corrosivity Evaluations of Ionic Liquids as Thermal Energy Storage Media.** *High Temperature Materials and Processes*. 2003; 22: pp. 87-94.

Rignall, T.; McCabe, C.; Woods, D.; Brady, J.; Himmel, M. **Molecular Modeling of the *T. reesei* CBH 1 Linker.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 6.

Ruth, M.F.; Thomas, S.R. **Effect of Corn Stover Composition on Ethanol Process Economics.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 3.

Saez, J.C.; Piazza, L.S.; McMillan, J.D. **Kinetic Studies of a Metabolically Engineered *Zymomonas mobilis* Fermenting Glucose and Zyllose Mixtures.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 84.

Schell, D.J.; Hamilton, J.; Saez, J.C.; Tholudur, A.; Newman, M.; Dowe, N.; McMillan, J.D. **Cellulase Production on Pure Cellulose Using *Trichoderma reesei* Strains L27, RL-P37, Rut C-30, and MTC-a-13.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 80.

Schell, D.J.; Riley, C.J.; Dowe, N.; Farmer, J.; Ibsen, K.N.; Ruth, M.F.; Toon, S.T.; Lumpkin, R.E. **Bioethanol Process Development Unit: Initial Operating Experiences and Results with a Corn Fiber Feedstock.** *Bioresource Technology*. 2004; 91: pp. 179-188.

Seibert, M.; Ghirardi, M. **Algal Hydrogen Production—Physiology and Process Development.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 141.

Skopec, C.; Brady, J.; Rignall, T.; McCabe, C.; Himmel, M. **Computer Simulations of Water Structuring Adjacent to Microcrystalline Cellulose 1 β Surfaces.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 166.

Sluiter, A.D.; Hayward, T.K.; Jurich, C.K.; Newman, M.M.; Templeton, D.W.; Ruth, M.F.; Evans, K.W.; Hames, B.R.; Thomas, S.R. **Compositional Variability Among Corn Stover Samples.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 30.

Sluiter, A.D.; Ruiz, R.O.; Hames, B.R. **Rapid Biomass Analysis: New Analytical Methods Supporting Biomass Pretreatment Research.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 163.

Spath, P.L.; Dayton, D.C. [Preliminary Screening—Technical and Economic Assessment of Synthesis Gas to Fuels and Chemicals with Emphasis on the Potential for Biomass-Derived Syngas.](#) December 2003; 160 pp. NREL/TP-510-34929.

Spath, P.L.; Mann, M.K. [Biomass Power and Conventional Fossil Systems with and without CO₂ Sequestration—Comparing the Energy Balance, Greenhouse Gas Emissions and Economics.](#) January 2004; 38 pp. NREL/TP-510-32575.

Spath, P.L.; Mann, M.K.; Amos, W.A. [Update of Hydrogen from Biomass—Determination of the Delivered Cost of Hydrogen.](#) Milestone Completion Report. December 2003; 104 pp. NREL/MP-510-33112.

Thomas, S.R.; Hayward, T.K.; Sluiter, A.D.; Templeton, D.W.; Evans, K.W.; Hames, B.R. **Near-Infrared Spectroscopy as a Genetic Screening Tool for Corn Stover Cell Wall Chemistry.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708).* Golden, CO: National Renewable Energy Laboratory, 2003; p. 23.

Tucker, M.P.; Nagle, N.J.; Jennings, E.; Lyons, R.; Elander, R. **Hot-Washing of Pretreated Corn Stover Using Integrated Sunds Horizontal Screw and Jaygo Pretreatment Reactors with Pneumapress Automatic Pressure Filter.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708).* Golden, CO: National Renewable Energy Laboratory, 2003; p. 165.

Tucker, M.P.; Nagle, N.J.; Jennings, E.; Nguyen, Q.A.; Kim, K.H.; Ibsen, K.; Noll, S. **Hydrolyzed Distiller's Grain Production, Fermentation and Animal Feeding Trials.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708).* Golden, CO: National Renewable Energy Laboratory, 2003; p. 168.

Tuskan, G.A.; Wullschleger, S.D.; Cushman, J.H.; Graham, R.L.; Thomas, S.R. **Mitigation of Greenhouse Warming, Biomass-Based Energy Supply Systems and Accelerated Domestication of Energy Crops.** Rosenberg, N.J., et al., eds. *Applications of Biotechnology to Mitigation of Greenhouse Warming: Proceedings of the St. Michaels Workshop, April 2003, Saint Michaels, Maryland.* Columbus, OH: Battelle Press, 2004; pp. 23-45.

Vanzin, G.F.; Smolinski, S.; Huang, J.; Maness, P.C. **Genetic Analysis of the CO-Shift Reaction in *Rubrivivax gelatinosus*.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708).* Golden, CO: National Renewable Energy Laboratory, 2003; p. 71.

Volkov, V.V.; Fadeev, A.G.; Khotimsky, V.S.; Litvinova, E.G.; Selinskaya, Y.A.; McMillan, J.D.; Kelley, S.S. **Effects of Synthesis Conditions on the Pervaporation Properties of Poly[1-(Trimethylsilyl)-1-Propyne] Useful for Membrane Bioreactors.** *Journal of Applied Polymer Science.* 15 February 2004; 91: pp. 2271-2277.

Wallace, B.; Yancey, M.; Easterly, J. **Bioethanol Co-location with a Coal-Fired Power Plant.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 121.

Wolfrum, E.J.; Watt, A.S.; Amos, W. **Biological Hydrogen Production from Synthesis Gas: Preliminary Techno-Economics and Reactor Design Issues.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 101.

Xiang, Q.; Lee, Y.Y.; Torget, R.W. **Kinetics of Glucose Decomposition Under Extremely Low Acid and High Temperature Conditions.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 167.

Zhang, M. **Engineering *Zymomonas mobilis* for Efficient Ethanol Production from Lignocellulosic Feedstocks.** (Abstract 29-CELL). *American Chemical Society. Abstracts of Papers: 225th ACS National Meeting, 23-27 March 2003, New Orleans, Louisiana*. Washington, DC: American Chemical Society, 2003; 1 p.

Zhang, M. **Pentose-Fermenting *Zymomonas mobilis*.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 178.

Zhu, Y.; Lee, Y.Y.; Elander, R. **Acid Hydrolysis of Corn Stover Hemicellulose by Low-Liquid Percolation Process.** *25th Symposium on Biotechnology for Fuels and Chemicals: Program and Abstracts (NREL/BK-510-33708)*. Golden, CO: National Renewable Energy Laboratory, 2003; p. 168.

Buildings

[Consumer's Guide: Heat Your Water with the Sun \(Brochure\)](#). December 2003; 20 pp. DOE/GO-102003-1824.

[Daylighting in Laboratories; Laboratories for the 21st Century: Best Practices \(Brochure\)](#). October 2003; 8 pp. DOE/GO-102003-1766.

[Moving Toward Zero Energy Homes: Armory Park del Sol, Tucson, Arizona \(Fact Sheet\)](#). December 2003; 2 pp. DOE/GO-102003-1829.

[Moving Toward Zero Energy Homes \(Fact Sheet\)](#). December 2003; 2 pp. DOE/GO-102003-1828.

[Moving Toward Zero Energy Homes: Lakeside, Elk Grove, California \(Fact Sheet\)](#). December 2003; 2 pp. DOE/GO-102003-1832.

[Moving Toward Zero Energy Homes: The Ultimate Family Home, Las Vegas, Nevada \(Brochure\)](#). December 2003; 4 pp. DOE/GO-102003-1827.

[Moving Towards Zero Energy Homes: Vista Montana, Watsonville, California \(Fact Sheet\)](#). December 2003; 2 pp. DOE/GO-102003-1831.

[New American Home® 2004: Las Vegas, Nevada](#). Building America Research that Works, Building Technology Program Brochure. December 2003; 6 pp. DOE/GO-102003-1837.

[U.S. LCI Database Project: 1st Quarterly Report and Development Plan Update, December 2002](#). March 2004; 17 pp. Work performed by Athena Sustainable Materials Institute, Merrickville, Ontario, Canada. NREL/SR-550-35623.

[U.S. LCI Database Project: Quarterly Progress Reports, 2003](#). March 2004; 32 pp. Work performed by Athena Sustainable Materials Institute, Merrickville, Ontario, Canada. NREL/SR-550-35620.

Deru, M.P.; Burns, P.J. **Infiltration and Natural Ventilation Model for Whole Building Energy Simulation of Residential Buildings**. *ASHRAE Transactions: Symposia*. 2003; pp. 801-811. For preprint version, including full text online document, see [NREL/CP-550-33698](#).

Jalalzadeh-Azar, A.A. **Parametric Analysis of a Grid-Independent BCHP System—Focusing on Impact of Technological Advancements**. *ASHRAE Transactions: Technical and Symposium Papers Presented at the 2003 Annual Meeting in Kansas City, Missouri of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.* 2003; Vol. 109, Part 2: pp. 69-78.

Masepohl, T. [On-Site Power Systems for Laboratories; Laboratories for the 21st Century: Best Practices Brochure](#). December 2003; 8 pp. DOE/GO-102003-1773.

Scahill, J.; Wolfrum, E.J.; Michener, W.E.; Bergmann, M.; Blake, D.M.; Watt, A.S. **New Method for the Rapid Determination of Volatile Organic Compound Breakthrough Times for a Sorbent at Concentrations Relevant to Indoor Air Quality.** *Journal of the Air and Waste Management Association*. January 2004; 54(1): pp. 105-110.

Torcellini, P.; Long, N.; Judkoff, R. [Consumptive Water Use for U.S. Power Production](#). December 2003; 18 pp. NREL/TP-550-33905.

Torcellini, P.; Long, N.; Judkoff, R. [Consumptive Water Use for U.S. Power Production: Preprint](#). November 2003; 11 pp. NREL/CP-550-35190.

Torcellini, P.A.; Crawley, D.B. [DOE's Public Database for Green Building Case Studies: Preprint](#). November 2003; 13 pp. NREL/CP-550-35424.

Distributed Energy Resources

[DTE Energy Technologies With Detroit Edison Co. and Kinectrics Inc.: Distributed Resources Aggregation Modeling and Field Configuration Testing.](#) Office of Electric Transmission and Distribution (OETD) Fact Sheet. October 2003; 2 pp. NREL/FS-560-35039.

[EPRI PEAC Corp.: Certification Model Program and Interconnection Agreement Tools.](#) Office of Electric Transmission and Distribution (OETD) Fact Sheet. October 2003; 2 pp. NREL/FS-560-35040.

[Gas Technology Institute and Encorp Inc.: Innovative Interconnection and Control Systems.](#) Office of Electric Transmission and Distribution (OETD) Fact Sheet. October 2003; 2 pp. NREL/FS-560-35041.

[General Electric: Universal Interconnection System Development.](#) Office of Electric Transmission and Distribution (OETD) Fact Sheet. October 2003; 2 pp. NREL/FS-560-35042.

[Institute of Electrical and Electronics Engineers: Interconnection Standards Development.](#) Office of Electric Transmission and Distribution (OETD) Fact Sheet. October 2003; 2 pp. NREL/FS-560-35043.

[National Rural Electric Cooperative Association: Residential Fuel Cell Demonstration Program.](#) Office of Electric Transmission and Distribution (OETD) Fact Sheet. October 2003; 2 pp. NREL/FS-560-35045.

[New York State Energy Research and Development Authority and Electrotek Concepts: Aggregating Distributed Generation.](#) Office of Electric Transmission and Distribution (OETD) Fact Sheet. October 2003; 2 pp. NREL/FS-560-35046.

[NiSource Energy Technologies Inc.: System Integration of Distributed Power for Complete Building Systems.](#) Office of Electric Transmission and Distribution (OETD) Fact Sheet. October 2003; 2 pp. NREL/FS-560-35047.

[NREL Distributed Energy Resources Test Facility: Advancing Distributed Power Technology.](#) Office of Electric Transmission and Distribution (OETD) Fact Sheet. October 2003; 2 pp. NREL/FS-560-35044.

[Orion Engineering Corp.: Intelligent Solutions for Distributed Power Technology.](#) Office of Electric Transmission and Distribution (OETD) Fact Sheet. October 2003; 2 pp. NREL/FS-560-35048.

[RealEnergy Inc.: Enterprise-Wide Distributed Energy Information System.](#) Office of Electric Transmission and Distribution (OETD) Fact Sheet. October 2003; 2 pp. NREL/FS-560-35049.

[Regulatory Assistance: Support for the Development of Regulatory Policies for Electricity's Second 100 Years.](#) Office of Electric Transmission and Distribution (OETD) Fact Sheet. October 2003; 2 pp. NREL/FS-560-35050.

[Underwriters Laboratories: Streamlining Interconnection.](#) Office of Electric Transmission and Distribution (OETD) Fact Sheet. October 2003; 2 pp. NREL/FS-560-35051.

[University of Wisconsin-Madison: Distributed Resources to Meet Demands of High-Value Power.](#) Office of Electric Transmission and Distribution (OETD) Fact Sheet. October 2003; 2 pp. NREL/FS-560-35052.

Basso, T.; DeBlasio, R. [IEEE 1547 Series of Standards: Interconnection Issues; Preprint.](#) September 2003; 8 pp. Posted with permission. NREL/JA-560-34882.

Basso, T.; Friedman, N.R. [IEEE 1547 National Standard for Interconnecting Distributed Generation: How Could It Help My Facility? Preprint.](#) November 2003; 9 pp. Submitted to *Distributed Energy*. Posted with permission. NREL/JA-560-34875.

Basso, T.S.; DeBlasio, R.D. **IEEE P1547-Series of Standards for Interconnection.** *Proceedings of the IEEE Power Engineering Society Transmission and Distribution Conference, 7-12 September 2003, Dallas, Texas.* Piscataway, NJ: Institute of Electrical and Electronics Engineers (IEEE), 2003; Vol. 2: pp. 556-561. For preprint version including online full-text document, see [NREL/CP-560-34003.](#)

Illindala, M.S.; Piagi, P.; Zhang, H.; Venkataramanan, G.; Lasseter, R.H. [Hardware Development of a Laboratory-Scale Microgrid Phase 2: Operation and Control of a Two-Inverter Microgrid.](#) March 2004; 153 pp. Work performed by Wisconsin Power Electronics Research Center, Madison, Wisconsin. NREL/SR-560-35059.

Johnson, M. [Current Solutions: Recent Experience in Interconnecting Distributed Energy Resources.](#) September 2003; 102 pp. NREL/SR-560-34864.

Key, T.; Sitzlar, H.E.; Ferraro, R. [DER Certification Laboratory Pilot, Accreditation Plan, and Interconnection Agreement Handbook.](#) November 2003; 87 pp. Work performed by EPRI PEAC Corp., Knoxville, Tennessee. NREL/SR-560-34588.

Kramer, R. [System Integration of Distributed Power for Complete Building Systems: Phase 1 Report.](#) December 2003; 198 pp. Work performed by NiSource Energy Technologies, Merrillville, Indiana. NREL/SR-560-34966.

Kramer, R. [System Integration of Distributed Power for Complete Building Systems: Phase 2 Report](#). December 2003; 258 pp. Work performed by NiSource Energy Technologies, Merrillville, Indiana. NREL/SR-560-35054.

Kroposki, B.; Basso, T.; DeBlasio, R. [Interconnection Testing of Distributed Resources: Preprint](#). February 2004; 9 pp. NREL/CP-560-35569.

Kroposki, B.; Englebretson, S.; Pink, C.; Daley, J.; Siciliano, R.; Hinton, D. [Validation of IEEE P1547.1 Interconnection Test Procedures: ASCO 7000 Soft Load Transfer System](#). September 2003; 52 pp. NREL/TP-560-34870.

Energy Efficiency and Renewable Energy

[Donald Bren Hall, Santa Barbara, California.](#) Laboratories for the 21st Century: Case Studies. February 2004; 8 pp. DOE/GO-102004-1794.

[Home Performance with ENERGY STAR[®] Exchange.](#) October 2003; 31 pp. NREL/BR-710-35075.

Energy Policy and Analysis

[HOMER: The Micropower Optimization Model](#). National Renewable Energy Laboratory (NREL) Innovation for Our Energy Future (Fact Sheet). March 2004; 2 pp. NREL/FS-710-35406.

Bird, L.; Swezey, B. [Green Power Marketing in the United States: A Status Report, Sixth Edition](#). October 2003; 70 pp. NREL/TP-620-35119.

Bird, L.; Swezey, B.; Aabakken, J. [Utility Green Pricing Programs: Design, Implementation, and Consumer Response](#). February 2004; 33 pp. NREL/TP-620-35618.

Goldstein, L.; Hedman, B.; Knowles, D.; Freedman, S.I.; Woods, R.; Schweizer, T. [Gas-Fired Distributed Energy Resource Technology Characterizations](#). November 2003; 226 pp. A joint project of the Gas Research Institute (GRI) and the National Renewable Energy Laboratory. NREL/TP-620-34783.

Wiser, R.; Olson, S.; Bird, L.; Swezey, B. [Utility Green Pricing Programs: A Statistical Analysis of Program Effectiveness](#). February 2004; 37 pp. LBNL-54437. NREL/TP-620-35609.

Federal Energy Management Program (FEMP)

[Alternative Fuel Vehicles.](#) Federal Energy Management Program (FEMP) Federal Technology Alert. September 2003; 20 pp. DOE/EE-0280.

[Energy Recovery for Ventilation Air in Laboratories; Laboratories for the 21st Century: Best Practices \(Brochure\).](#) October 2003; 8 pp. DOE/GO-102003-1774.

[Nidus Center for Scientific Enterprise, St. Louis, Missouri; Laboratories for the 21st Century: Case Studies \(Brochure\).](#) October 2003; 8 pp. DOE/GO-102003-1772.

[Save with Renewable Energy: A Technical Bulletin for Federal Renewable Energy Champions.](#) Federal Energy Management Program (FEMP). November 2003; 8 pp. DOE/GO-102003-1821.

Hydrogen

Amos, W.A. [Biological Water-Gas Shift Conversion of Carbon Monoxide to Hydrogen: Milestone Completion Report.](#) January 2004; 26 pp. NREL/MP-560-35592.

Amos, W.A. [Updated Cost Analysis of Photobiological Hydrogen Production from *Chlamydomonas reinhardtii* Green Algae: Milestone Completion Report.](#) January 2004; 32 pp. NREL/MP-560-35593.

Evans, R.J.; Chornet, E.; Czernik, S.; Feik, C.; French, R.; Phillips, S.; Yeboah, Y.D.; Day, D.; Ellis, S.; McGee, D.; Realff, M.J. **Hydrogen from Biomass by Catalytic Steam Reforming of Biomass Pyrolysis Vapors.** (Abstract 46-FUEL). *American Chemical Society. Abstracts of Papers: 226th ACS National Meeting, 7-11 September 2003, New York, New York.* Washington, DC: American Chemical Society, 2003; 1 p.

Evans, R.J.; Chornet, E.; Czernik, S.; Feik, C.; French, R.; Phillips, S.; Yeboah, Y.D.; Day, D.; Ellis, S.; McGee, D.; Realff, M.J. **Renewable Hydrogen Production by Catalytic Steam Reforming of Peanut Shells Pyrolysis Products.** *American Chemical Society. Preprints of Papers: Division of Fuels Chemistry.* Washington, DC: American Chemical Society, 2003; Vol. 48, No. 2: pp. 594-595.

French, R.J.; Czernik, S. **Hydrogen Production by Steam Reforming of Waste Vegetable Oils.** (Abstract 45-FUEL). *American Chemical Society. Abstracts of Papers: 226th ACS National Meeting, 7-11 September 2003, New York, New York.* 2003; 1 p.

Leisch, J.E.; Bhattacharya, R.N.; Teeter, G.; Turner, J.A. **Preparation and Characterization of Cu(In,Ga)(Se,S)₂ Thin Films from Electrodeposited Precursors for Hydrogen Production.** *Solar Energy Materials and Solar Cells.* 6 February 2004; 81(2): pp. 249-259.

Turner, J.A. **Hydrogen Could Fuel the Digital Electric Grid.** *Electronic Design.* 12 January 2004; 52(1): p. 24.

Industry

[\\$707,000 in Savings Identified in Boise Cascade Assessment: Plant-Wide Assessment Summary—Forest Products \(Revised\)](#). Industrial Technologies Program BestPractices Fact Sheet. October 2003; 2 pp. DOE/GO-102003-1698.

[American Water Heater Company: Compressed Air System Optimization Project Saves Energy and Improves Production at Water Heater Plant](#). Industrial Technologies Program BestPractices Case Study (Brochure). November 2003; 4 pp. DOE/GO-102003-1716.

[Blue Heron Paper Company: Oregon Mill Uses Model-Based Energy Assessment to Identify Energy and Cost Savings Opportunities](#). Industrial Technologies Program (ITP) Pulp & Paper BestPractices Plant-Wide Assessment Case Study (Brochure). March 2004; 4 pp. DOE/GO-102004-1758.

[Corning Inc.: Proposed Changes at Glass Plant Indicate \\$26 Million in Potential Savings](#). Industrial Technologies Program (ITP) Glass BestPractices Plant-Wide Assessment Case Study. January 2004; 4 pp. DOE/GO-102004-1721.

[Decision Tools for Industry: A Portfolio of Powerful Assessment Tools \(CD-ROM\)](#). December 2003; DOE/GO-102003-1841.

[DOE Industrial Technologies Program \(ITP\) E-Bulletin, February 2004 \(Newsletter\)](#). February 2004; 2 pp. DOE/GO-102004-1855.

[DOE Industrial Technologies Program \(ITP\) E-Bulletin, January 2004 \(Newsletter\)](#). January 2004; 2 pp. DOE/GO-102004-1854.

[DOE Industrial Technologies Program \(ITP\) E-Bulletin, March 2004 \(Newsletter\)](#). March 2004; 2 pp. DOE/GO-102004-1856.

[Energy Matters—Fall 2003](#). October 2003; 8 pp. DOE/GO-102003-1801.

[Energy Matters—Winter 2004](#). March 2004; 8 pp. DOE/GO-102004-1852.

[Ford Cleveland: Inside-Out Analysis Identifies Energy and Cost Savings Opportunities at Metal Casting Plant](#). Industrial Technologies Program Metal Casting BestPractices Plant-Wide Assessment Case Study. September 2003; 4 pp. DOE/GO-102003-1678.

[Georgia-Pacific: Crossett Mill Identifies Heat Recovery Projects and Operational Improvements that May Save \\$9.6 Million Annually](#). Industrial Technologies Program Forest Products BestPractices Plant-Wide Assessment Case Study. November 2003; 4 pp. DOE/GO-102003-1722.

[Lehigh Southwest Cement Company: Compressed Air System Improvement Saves Energy at a Lehigh Southwest Cement Plant.](#)

Industrial Technologies Program BestPractices Case Study. October 2003; 4 pp. DOE/GO-102003-1743.

[Ohio Aluminum Industries: Compressed Air System Improvement Project Saves Energy and Improves Product Quality.](#)

Industrial Technologies Program BestPractices Case Study (Brochure). November 2003; 4 pp. DOE/GO-102003-1655.

[Partnering for Success.](#) Industrial Technologies Program. February 2004; 48 pp. DOE/GO-102004-1705.

[Steam Digest 2002.](#) November 2003; 92 pp. Compiled by the Alliance to Save Energy. DOE/GO-102003-1805.

[W.R. Grace: Plant Uses Six Sigma Methodology and Traditional Heat Balance Analysis to Identify Energy Conservation](#)

[Opportunities at Curtis Bay Works \(Revised\).](#) Industrial Technologies Program Chemicals BestPractices Plant-Wide Assessment Case Study. December 2003; 6 pp. DOE/GO-102003-1650.

[Weirton Steel: Mill Identifies \\$1.4 Million in Annual Savings Following Plant-Wide Energy-Efficiency Assessment.](#) Industrial Technologies Program Steel BestPractices Plant-Wide Assessment Case Study (Brochure). January 2004; 4 pp. DOE/GO-102004-1730.

[Working with ITP: Industrial Technologies Program \(Fact Sheet\).](#) March 2004; 2 pp. DOE/GO-102004-1900.

Materials Science and Semiconductors

Chang, C.H.; Wei, S.H.; Johnson, J.W.; Zhang, S.B.; Leyarovska, N.; Bunker, G.; Anderson, T.J. **Local Structure of CuIn₃Se₅: X-Ray Absorption Fine Structure Study and First-Principles Calculations.** Article No. 054108. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(05): 9 pp.

Ellis, W.W.; Ciancanelli, R.; Miller, S.M.; Raebiger, J.W.; DuBois, M.R.; DuBois, D.L. **Thermodynamic Hydride Donor Abilities of [HW(CO)₄L]⁻ Complexes (L = PPh₃, P(OMe)₃, CO) and Their Reactions with [C₅Me₅Re(PMe₃)(NO)(CO)]⁺.** *Journal of the American Chemical Society*. 2003; 125: pp. 12230-12236.

Francoeur, S.; Seong, M.J.; Hanna, M.C.; Geisz, J.F.; Mascarenhas, A. **Origin of the Nitrogen-Induced Optical Transitions in GaAs_{1-x}N_x.** Article No. 075207. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(07): 5 pp.

Gregg, B.A. **Comment on “Diffusion Impedance and Space Charge Capacitance in the Nanoporous Dye-Sensitized Electrochemical Solar Cell” and “Electronic Transport in Dye-Sensitized Nanoporous TiO₂ Solar Cells—Comparison of Electrolyte and Solid-State Devices”.** *Journal of Physical Chemistry B*. 2003; 107: pp. 13540.

Gregg, B.A.; Chen, S.G.; Branz, H.M. **On the Superlinear Increase in Conductivity with Dopant Concentration in Excitonic Semiconductors.** *Applied Physics Letters*. 8 March 2004; 84(10): pp. 1707-1709.

Hanna, M.C.; Micic, O.I.; Seong, M.J.; Ahrenkiel, S.P.; Nedeljkovic, J.M.; Nozik, A.J. **GaInP₂ Overgrowth and Passivation of Colloidal InP Nanocrystals Using Metalorganic Chemical Vapor Deposition.** *Applied Physics Letters*. 2 February 2004; 84(5): pp. 780-782.

Janotti, A.; Wei, S.H. **Epitaxially Stabilized AgGaSe₂ for High-Efficiency Spin-Polarized Electron Source.** *Journal of Physics and Chemistry of Solids*. 2003; 64: pp. 1881-1885.

Jones, M.; Nedeljkovic, J.; Ellingson, R.J.; Nozik, A.J.; Rumbles, G. **Photoenhancement of Luminescence in Colloidal CdSe Quantum Dot Solutions.** *Journal of Physical Chemistry B*. 2003; 107: pp. 11346-11352.

Karazhanov, S.Zh.; Zhang, Y.; Wang, L.W.; Mascarenhas, A.; Deb, S. **Resonant Defect States and Strong Lattice Relaxation of Oxygen Vacancies in WO₃.** Article No. 233204. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(23): 4 pp.

Kim, Y.H.; Choi, J.; Chang, K.J.; Tomanek, D. **Defective Fullerenes and Nanotubes as Molecular Magnets: An ab initio Study.** Article No. 125420. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(12): 4 pp.

Kopidakis, N.; Benkstein, K.D.; van de Lagemaat, J.; Frank, A.J. **Transport-Limited Recombination of Photocarriers in Dye-Sensitized Nanocrystalline TiO₂ Solar Cells.** *Journal of Physical Chemistry B*. 2003; 107: pp. 11307-11315.

Langof, L.; Fradkin, L.; Ehrenfreund, E.; Lifshitz, E.; Micic, O.I.; Nozik, A.J. **Colloidal InP/ZnS Core-Shell Nanocrystals Studied by Linearly and Circularly Polarized Photoluminescence.** *Chemical Physics*. 16 February 2004; 297(1-3): pp. 93-98.

Lee, S.H.; Cheong, H.M.; Liu, P.; Tracy, C.E.; Pitts, R.J.; Deb, S.K. **Improving the Durability of Ion Insertion Materials in a Liquid Electrolyte.** *Solid State Ionics*. 2003; 165: pp. 81-87.

Lee, S.H.; Liu, P.; Cheong, H.M.; Tracy, C.E.; Deb, S.K. **Electrochromism of Amorphous Ruthenium Oxide Thin Films.** *Solid State Ionics*. 2003; 165: pp. 217-221.

Lee, S.H.; Liu, P.; Tracy, C.E. **Lithium Thin-Film Battery with a Reversed Structural Configuration SS/Li/Lipon/LixV₂O₅/Cu.** *Electrochemical and Solid-State Letters*. 2003; 6: pp. A275-A277.

Li, J.; Nam, K.B.; Nakarmi, M.L.; Lin, J.Y.; Jiang, H.X.; Carrier, P.; Wei, S.H. **Band Structure and Fundamental Optical Transitions in Wurtzite AlN.** *Applied Physics Letters*. 22 December 2003; 83(25): pp. 5163-5165.

Li, J.H.; Moss, S.C.; Zhang, Y.; Mascarenhas, A.; Pfeiffer, L.N.; West, K.W.; Ge, W.K.; Bai, J. **Layer Ordering and Faulting in (GaAs)_n/(AlAs)_n Ultrashort-Period Superlattices.** Article No. 106103. *Physical Review Letters*. 2003; 91(10): 4 pp.

Liu, P.; Lee, S.H.; Tracy, C.E.; Turner, J.A.; Pitts, J.R.; Deb, S.K. **Electrochromic and Chemochromic Performance of Mesoporous Thin-Film Vanadium Oxide.** *Solid State Ionics*. 2003; 165: pp. 223-228.

Mascarenhas, A.; Seong, M.J.; Yoon, S.; Verley, J.C.; Geisz, J.F.; Hanna, M.C. **Evolution of Electronic States in GaAs_{1-x}N_x Probed by Resonant Raman Spectroscopy.** Article No. 233201. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(23): 3 pp.

Norman, A.G.; Hanna, M.C.; Romero, M.J.; Jones, K.M.; Al-Jassim, M.M. **Characterization of MOCVD Lateral Epitaxial Overgrown III-V Semiconductor Layers on GaAs Substrates.** *Proceedings of the 2003 International Symposium on Compound Semiconductors, 25-27 August 2003, San Diego, California*. Piscataway, NJ: Institute of Electrical and Electronics Engineers, Inc. (IEEE), 2003; pp. 45-46.

Segev, D.; Wei, S.H. **Design of Shallow Donor Levels in Diamond by Isovalent-Donor Coupling.** Article No. 126406. *Physical Review Letters*. 2003; 91(12): 4 pp.

Wu, K.; Fujikawa, Y.; Nagao, T.; Hasegawa, Y.; Nakayama, K.S.; Xue, Q.K.; Wang, E.G.; Briere, T.; Kumar, V.; Kawazoe, Y.; Zhang, S.B.; Sakurai, T. **Na Adsorption on the Si(111)-(7 x 7) Surface: From Two-Dimensional Gas to Nanocluster Array.** Article No. 126101. *Physical Review Letters*. 2003; 91(12): 4 pp.

National Renewable Energy Laboratory

Touryan, K. **National Labs and Industry Assist FSU Institutes.** *Physics Today*. 2003; 56(11): 2 pp.

Photoconversion

Antal, T.K.; Krendeleva, T.E.; Laurinavichene, T.V.; Makarova, V.V.; Ghirardi, M.L.; Rubin, A.B.; Tsygankov, A.A.; Seibert, M.
Dependence of Algal H₂ Production on Photosystem II and O₂ Consumption Activities in Sulfur-Deprived *Chlamydomonas reinhardtii* Cells. *Biochimica et Biophysica Acta*. 2003; 1607(2-3): pp. 153-160.

Solar Energy—Photovoltaics

[High-Performance PV Project: Exploring and Accelerating Ultimate Pathways, Phase 1B Review Meeting, October 20-21, 2003 \(CD-ROM\)](#). December 2003; NREL/CD-520-35267.

[Million Solar Roofs: Become One In A Million](#). Energy Efficiency and Renewable Energy (EERE) (Brochure). November 2003; 4 pp. DOE/GO-102003-1733.

[PV FAQs: How Much Land Will PV Need to Supply Our Electricity?](#) Solar Energy Technologies Program (Fact Sheet). January 2004; 2 pp. DOE/GO-102003-1835.

[PV FAQs: What Is the Energy Payback for PV?](#) Solar Energy Technologies Program (Fact Sheet). January 2004; 2 pp. DOE/GO-102004-1847.

[PV FAQs: Will We Have Enough Materials for Energy-Significant PV Production?](#) Solar Energy Technologies Program (Fact Sheet). January 2004; 2 pp. DOE/GO-102004-1834.

[PV Manufacturing R&D Project \(Trifold Brochure\)](#). February 2004; 4 pp. DOE/GO-102004-1893. NREL/FS-520-35491.

Abken, A.; Hambro, C.; Meyers, P.; Powell, R.; Zafar, S. **Manufacturing and Technology Development Programs at First Solar**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by First Solar LLC, Perrysburg, Ohio.

AbuShama, J.A.; Johnston, S.; Ahrenkiel, R.; Crandall, R.; Young, D.; Noufi, R. **Evolution of Electronic Properties of Cu(In,Ga)Se₂ (CIGS)-Based Solar Cells During a 3-Stage Growth Process**. Noufi, R. et al., eds. *Compound Semiconductor Photovoltaics: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 763. Warrendale, PA: Materials Research Society, 2003; pp. 255-260. For preprint version including online full-text document, see [NREL/CP-520-33949](#).

AbuShama, J.A.M.; Johnston, S.; Moriarty, T.; Teeter, G.; Ramanathan, K.; Noufi, R. **Properties of ZnO/CdS/CuInSe₂ Solar Cells with Improved Performance**. *Progress in Photovoltaics: Research and Applications*. 2004; 12(1): pp. 39-45.

Agro, S.C.; Tucker, R.T. [Development of New Low-Cost, High-Performance, PV Module Encapsulant/Packaging Materials: Annual Technical Progress Report, Phase 1, 22 October 2002–30 September 2003.](#) March 2004; 31 pp. Work performed by Specialized Technology Resources, Inc., Enfield, Connecticut.

Barth, K.L.; Enzenroth, R.A.; Sampath, W.S. **Progress in Continuous, In-Line Processing of Stable CdS/CdTe Devices.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 3 pp. Work performed by Colorado State University, Fort Collins, Colorado.

Biswas, R.; Pan, B.C. **Nano-Crystalline Silicon: A New Solar Material.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 3 pp. Work performed by Iowa State University, Ames, Iowa.

Bohland, J.; McMaster, A.; Henson, S.; Hanak, J. [Specific PVMaT R&D in CdTe Product Manufacturing: Final Subcontract Report, March 2003.](#) January 2004; 74 pp. Work performed by First Solar, LLC, Perrysburg, Ohio. NREL/SR-520-35177.

Cohen, D.J.; Heath, J.T.; Shafarman, W.N. **New Method for the Study of Defect Distributions in the Copper Indium Diselenide Alloys.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by University of Oregon, Eugene, Oregon; University of Delaware, Newark, Delaware.

Collins, R.W.; Ferlauto, A.S.; Ferreira, G.M.; Koh, J.; Chen, C.; Koval, R.J.; Pearce, J.M.; Wronski, C.R.; Al-Jassim, M.M.; Jones, K.M. **Application of Deposition Phase Diagrams for the Optimization of a-Si:H-Based Materials and Solar Cells.** Abelson, J.R., et al., eds. *Amorphous and Nanocrystalline Silicon-Based Films—2003: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 762. Warrendale, PA: Materials Research Society, 2003; pp. 443-454.

Collins, R.W.; Ferreira, G.M.; Pearce, J.M.; Ferlauto, A.S.; Koval, R.J.; Wronski, C.R. **Real Time Optics of the Growth of Silicon Thin Films in Photovoltaics: Analysis of the Amorphous-to-Microcrystalline Phase Transition.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by The Pennsylvania State University, University Park, Pennsylvania.

Collins, R.W.; Wronski, C.R. [Real Time Optics of the Growth of Textured Silicon Films in Photovoltaics: Final Technical Report, 1 August 1999—12 August 2002.](#) October 2003; 24 pp. Work performed by The Pennsylvania State University, University Park, Pennsylvania. NREL/SR-520-34823.

Compaan, A.D.; Deng, X.; Bohn, R.G. [High Efficiency Thin Film CdTe and a-Si Based Solar Cells: Final Technical Report, 4 March 1998—15 October 2001.](#) October 2003; 153 pp. Work performed by the University of Toledo, Toledo, Ohio.

Coutts, T.J.; Li, X.; Ginley, D.S.; Perkins, J.D.; Wei, S.H.; Nie, X.; Zhang, S.B. **Overview of Research into Transparent Conducting Oxides at NREL.** Vincenzini, P., ed. *CIMTEC 2002: Proceedings of the 10th International Ceramics Congress and 3rd Forum on New Materials, July 2002, Florence, Italy.* Faenza, Italy: Techna Srl, 2003; Part D: pp. 1061-1072.

Coutts, T.J.; Ward, S.J.; Young, D.L.; Emery, K.A.; Gessert, T.A.; Noufi, R. **Critical Issues in the Design of Polycrystalline, Thin-Film Tandem Solar Cells.** *Progress in Photovoltaics: Research and Applications.* 2003; 11: pp. 359-375.

Crandall, R.S. **Meyer-Neldel Rule in Deep-Level-Transient-Spectroscopy and its Ramifications.** Noufi, R. et al., eds. *Compound Semiconductor Photovoltaics: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California.* Materials Research Society Symposium Proceedings, Vol. 763. Warrendale, PA: Materials Research Society (MRS), 2003; pp. 79-83.

Dalal, V.L.; Niu, X. **Growth and Properties of Microcrystalline Ge-C Films and Devices.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM).* NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 3 pp. Work performed by Iowa State University, Ames, Iowa.

Dalal, V.L.; Zhu, J.H.; Sharma, P. **Growth of High Quality a-Ge:H Solar Cells.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM).* NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 3 pp. Work performed by Iowa State University, Ames, Iowa.

Das, U.; Morrison, S.; Madan, A. **Thin Film Silicon Materials and Solar Cells Grown by Pulsed PECVD Technique.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM).* NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 2 pp. Work performed by MVSystems, Inc., Golden, Colorado.

Davidson, J.H.; Mantell, S.C.; Jorgensen, G.J. **Chapter 4: Status of the Development of Polymeric Solar Water Heating Systems.** Goswami, D.Y., ed. *Advances in Solar Energy: An Annual Review of Research and Development, Volume 15.* Boulder, CO: American Solar Energy Society, Inc. (ASES), 2003; pp. 149-186.

Delahoy, A.; Chen, L.; Akhtar, M.; Cambridge, J.; Govindarajan, R.; Ziobro, F. **Advanced CIGS Photovoltaic Technology.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM).* NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by Energy Photovoltaics, Inc., Princeton, New Jersey.

Deng, X.; Du, W.; Yang, X.; Povolny, H. **High-Efficiency Single-Junction a-SiGe Solar Cells**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 2 pp. Work performed by University of Toledo, Toledo, Ohio.

Dexheimer, S.L.; Lynn, K.G. [Novel Characterization Methods for Microcrystalline Silicon: Final Report, May 1999—December 2002](#). October 2003; 18 pp. Work performed by Washington State University, Pullman, Washington. NREL/SR-520-34949.

Dhere, N.G.; Jahagirdar, A.H.; Kadam, A.A.; Gade, V.S.; Kulkarni, S.S.; Patil, H.P.; Bet, S.M. **Development of Large Area CIGSS Thin Film Solar Cells**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by Florida Solar Energy Center, Cocoa, Florida.

Dhere, R.; Gessert, T.; Zhou, J.; Asher, S.; Pankow, J.; Moutinho, H. **Investigation of CdZnTe for Thin-Film Tandem Solar Cell Applications**. Noufi, R., et al., eds. *Compound Semiconductor Photovoltaics: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 763. Warrendale, PA: Materials Research Society (MRS), 2003; pp. 409-414. For preprint version including online full-text document, see [NREL/CP-520-33965](#).

Dillon, A.C.; Mahan, H.A.; Parilla, P.A.; Alleman, J.L.; Heben, M.J.; Jones, K.M.; Gilbert, K.E.H. **Continuous Hot Wire Chemical Vapor Deposition of High-Density Carbon Multiwall Nanotubes**. *Nano Letters*. 2003; 3(10): pp. 1425-1429.

Dinea, S.; Dylla, T.; Liang, J.; Middy, A.R.; Schiff, E.A.; Wang, W.; Zhu, K. **Transport, Interfaces, and Modeling in Amorphous Silicon Based Solar Cells**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 3 pp. Work performed by Syracuse University, Syracuse, New York.

Eberspacher, C.; Pauls, K.; Serra, J. **Non-Vacuum Processing of CIGS Solar Cells**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 5 pp. Work performed by Unisun, Newbury Park, California.

Ebil, O.; Aparicio, R.; Hegedus, S.; Birkmire, R. **Growth and Characterization of HWCVD Si Films on Al Coated Glass**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by University of Delaware, Newark, Delaware.

Fauchet, P. [Porous Polycrystalline Silicon Thin Film Solar Cells: Final Report, 24 May 1999—24 May 2002](#). October 2003; 20 pp. Work performed by the University of Rochester, Rochester, New York. NREL/SR-520-34824.

Feldman, S.D.; Seymour, F.H.; Ohno, T.R.; Kaydanov, V.; Collins, R.T. **Development and Application of Electroluminescence Imaging for CdS/CdTe Characterization**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by Colorado School of Mines, Golden, Colorado.

Ferlauto, A.S.; Ferreira, G.M.; Koval, R.J.; Pearce, J.M.; Wronski, C.R.; Collins, R.W.; Al-Jassim, M.M.; Jones, K.M. **Evolution of Crystallinity in Mixed-Phase (a+ μ c)-Si:H as Determined by Real Time Spectroscopic Ellipsometry**. Abelson, J.R., et al., eds. *Amorphous and Nanocrystalline Silicon-Based Films—2003: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 762. Warrendale, PA: Materials Research Society, 2003; pp. 539-544.

Fetzer, C.M.; King, R.R.; Colter, P.C.; Edmondson, K.M.; Law, D.C.; Stavrides, A.P.; Yoon, H.; Ermer, J.H.; Romero, M.J.; Karam, N.H. **High-Efficiency Metamorphic GaInP/GaInAs/Ge Solar Cells Grown by MOVPE**. Bhat, R. and Caneau, C.G., eds. *Journal of Crystal Growth*. Proceedings of the 11th Biennial Workshop on Organometallic Vapor Phase Epitaxy (OMVPE), 20-24 July 2003, Keystone, Colorado. 19 January 2004; 261(2-3): pp. 341-348.

Fontcuberta i Morral, A.; Zahler, J.M.; Atwater, H.A.; Ahrenkiel, S.P.; Wanlass, M.W. **InGaAs/InP Double Heterostructures on InP/Si Templates Fabricated by Wafer Bonding and Hydrogen-Induced Exfoliation**. *Applied Physics Letters*. 29 December 2003; 83(26): pp. 5413-5415.

Fontcuberta i Morral, A.; Zahler, J.M.; Atwater, H.A.; Frank, M.M.; Chabal, Y.J.; Ahrenkiel, P.; Wanlass, M. **Electrical and Structural Characterization of the Interface of Wafer Bonded InP/Si**. Noufi, R., et al., eds. *Compound Semiconductor Photovoltaics: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 763. Warrendale, PA: Materials Research Society (MRS), 2003; pp. 99-104.

Ganguly, G.; Carlson, D.E.; Bennett, M.S.; Willing, F.; Arya, R.R.; Stradins, P. **Room Temperature Recovery of Light Induced Changes in Amorphous Silicon Solar Cells**. Abelson, J.R., et al., eds. *Amorphous and Nanocrystalline Silicon-Based Films—2003: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 762. Warrendale, PA: Materials Research Society, 2003; pp. 393-398.

Geisz, J.F.; Reedy, R.C.; Keyes, B.M.; Metzger, W.K. **Unintentional Carbon and Hydrogen Incorporation in GaNP Grown by Metal-Organic Chemical Vapor Deposition.** *Journal of Crystal Growth.* 2003; 259: pp. 223-231.

Gessert, T.A.; Romero, M.J.; Dhere, R.G.; Asher, S.E. **Analysis of the ZnTe:Cu Contact on CdS/CdTe Solar Cells.** Noufi, R., et al., eds. *Compound Semiconductor Photovoltaics: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California.* Materials Research Society Symposium Proceedings, Vol. 763. Warrendale, PA: Materials Research Society (MRS), 2003; pp. 133-138. For preprint version including online full-text document, see [NREL/CP-520-33940](http://www.nrel.gov/publications/CP-520-33940).

Ginley, D.; Roy, B.; Ode, A.; Warmsingh, C.; Yoshida, Y.; Parilla, P.; Teplin, A.; Kaydanova, T.; Miedaner, A.; Curtis, C.; Martinson, A.; Coutts, T.; Readey, D.; Hosono, H.; Perkins, J. **Non-Vacuum and PLD Growth of Next Generation TCO Materials.** Hosono, H., et al., eds. *Thin Solid Films.* Proceedings of the 3rd International Symposium on Transparent Oxide Thin Films for Electronics and Optics, 10-11 April 2003, Tokyo, Japan. 15 December 2003; 445(2): pp. 193-198.

Ginley, D.; Warmsingh, C.; del Cueto, J.; van Hest, M.; Gedvilas, L.; Keyes, B.; To, B.; Li, X.; Readey, D.; Perkins, J. **Combinatorial Approaches to Discovery and Optimization of Transparent Conducting Oxides in the ZnSnO_x System.** Vincenzini, P., ed. *CIMTEC 2002: Proceedings of the 10th International Ceramics Congress and 3rd Forum on New Materials, July 2002, Florence, Italy.* Faenza, Italy: Techna Srl, 2003; Part D: pp. 1009-1020.

Green, M.A.; Emery, K.; King, D.L.; Igari, S.; Warta, W. **Solar Cell Efficiency Tables (Version 23).** *Progress in Photovoltaics: Research and Applications.* 2004; 12: pp. 55-62.

Han, S.H.; Levi, D.H.; Althani, H.A.; Hasoon, F.S.; Bhattacharya, R.N.; Hermann, A.M. **Optical Functions of Thin-Film Polycrystalline Chalcopyrite CuIn_{1-x}Ga_xSe₂.** Noufi, R., et al., eds. *Compound Semiconductor Photovoltaics: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California.* Materials Research Society Symposium Proceedings, Vol. 763. Warrendale, PA: Materials Research Society (MRS), 2003; pp. 47-52.

Hanoka, J.I.; Wallace, R.L.; Gabor, A.M. **Innovative Approaches to Low Cost Module Manufacturing of String Ribbon Si PV Modules.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM).* NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 3 pp. Work performed by Evergreen Solar, Marlboro, Massachusetts.

He, S.; Danyluk, S.; Ostapenko, S. **Residual Stress Characterization for Solar Cells by Infrared Polariscopy.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM).* NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by Georgia Institute of Technology, Atlanta, Georgia; University of South Florida, Tampa, Florida.

Henson, S.; Smigielski, K.; Hanak, J.; Borgeson, F.; Meyers, P.; McMaster, A. **Specific PVMaT R&D in CdTe Product Manufacturing.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 2 pp. Work performed by First Solar, LLC, Perrysburg, Ohio.

Hu, J.; Jackson, W.; Ward, S.; Stradins, P.; Branz, H.M.; Wang, Q. **Area-Dependent Switching in Thin Film-Silicon Devices.** Abelson, J.R., et al., eds. *Amorphous and Nanocrystalline Silicon-Based Films—2003: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 762. Warrendale, PA: Materials Research Society, 2003; pp. 157-162.

Hu, J.; Ward, S.; Wang, Q. **Electric Switching in Sol-Gel Derived SiO₂ Films.** McCall, M.W., and Dewar G., eds. *Complex Mediums IV: Beyond Linear Isotropic Dielectrics. Proceedings of SPIE—The International Society for Optical Engineering. Vol. 5218, 4-5 August 2003, San Diego, California*. Bellingham, WA: The International Society for Optical Engineering (SPIE), 2003; pp 21-28.

Hu, J.; Ward, S.; Wang, Q. **Field-Induced Electric Switching in Sol-Gel-Derived SiO₂ Films.** *Applied Physics Letters*. 2003; 83(15): pp. 3153-3155.

Iwaniczko, E.; Mahan, A.H.; Yan, B.; Gedvilas, L.N.; Williamson, D.L.; Nelson, B.P. **Deposition of Device Quality μ -Si Films and Solar Cells at High Rates by HWCVD in a W Filament Regime where W/Si Formation is Minimal.** Abelson, J.R., et al., eds. *Amorphous and Nanocrystalline Silicon-Based Films—2003: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 762. Warrendale, PA: Materials Research Society, 2003; pp. 387-392.

Jansen, K.W.; Volltrauer, H.; Delahoy, A.E.; Johnson, B.; McCort, R.; Varvar, A. **Recent Manufacturing Technology Developments at EPV.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by Energy Photovoltaics, Inc., Princeton, New Jersey.

Jenkins, C.; Pudov, A.; Gloeckler, M.; Demtsu, S.; Nagle, T.; Fahrenbruch, A.; Sites, J. **CdTe Back Contact: Response to Copper Addition and Out-Diffusion.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by Colorado State University, Fort Collins, Colorado.

Jensen, G.; Schaefer, J.; Hanket, G.M.; Eser, E.; Wiedeman, S. **Back Contact Cracking During Fabrication of CIGS Solar Cells on Polyimide Substrates.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 5 pp. Work performed by ITN Energy Systems, Inc., Littleton, Colorado; Institute of Energy Conversion, Newark, Delaware; Global Solar Energy, Inc., Tucson, Arizona.

Jiang, C.S.; Hasoon, F.S.; Moutinho, H.R.; Al-Thani, H.A.; Romero, M.J.; Al-Jassim, M.M. **Measurement of Built-In Electrical Potential in Cu(In,Ga)Se₂ Solar Cells**. Noufi, R., et al., eds. *Compound Semiconductor Photovoltaics: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 763. Warrendale, PA: Materials Research Society, 2003; pp. 309-314.

Johnston, S.W.; Ahrenkiel, R.K.; Tu, C.W.; Hong, Y.G. **Measurement of Charge-Separation Potentials in GaAs_{1-x}N_x**. *Journal of Vacuum Science & Technology. A, Vacuum, Surfaces, and Films*. 2003; 21(5): pp. 1765-1769.

Johnston, S.W.; Crandall, R.S. **Evidence of the Meyer-Neldel Rule in InGaAsN Alloys: Consequences for Photovoltaic Materials**. Noufi, R., et al., eds. *Compound Semiconductor Photovoltaics: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 763. Warrendale, PA: Materials Research Society (MRS), 2003; pp. 85-90. For preprint version including online full-text document, see [NREL/CP-520-33229](http://www.nrel.gov/CP-520-33229).

Jones, S.J.; Demaggio, G.; Doehler, J.; Liu, T.; Tsu, D. **Development of Optically Enhanced Back Reflectors for Amorphous Silicon-Based Photovoltaic Technologies**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 2 pp. Work performed by Energy Conversion Devices Inc., Troy, Michigan.

Kalejs, J.; Bathey, B.; Cao, J.; Doedderlein, J.; Gonsiorawski, R.; Heath, B.; Mackintosh, B.; Ouellette, M.; Rosenblum, M.; Southimath, B.; Xavier, G. **EFG Ribbon Technology R&D for Large Scale Photovoltaic Manufacturing**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by RWE Schott Solar Inc., Billerica, Massachusetts.

Kapur, V.K.; Bansal, A.; Le, P.; Asensio, O.; Shigeoka, N. **Lab to Large Scale Transition for Non-Vacuum Thin Film CIGS Solar Cells: Phase I Annual Technical Report, 1 August 2002—31 July 2003**. February 2004; 24 pp. Work performed by International Solar Electric Technology, Inc. (ISET), Inglewood, California. NREL/SR-520-35574.

Kasap, S.O.; Gunes, M.; Johanson, R.E.; Wang, Q.; Yang, J.; Guha, S. **Conductance Fluctuations in a-Si:H: Effects of Alloying and Device Structure**. *Journal of Materials Science: Materials in Electronics*. 2003; 14: pp. 693-696.

Kaydanova, T.; Miedaner, A.; Curtis, C.; Alleman, J.; Perkins, J.D.; Ginley, D.S. **Direct Inkjet Printing of Composite Thin Barium Strontium Titanate Films**. *Journal of Materials Research*. December 2003; 18(12): pp. 2820-2825.

Kestner, J.; McElvain, S.; Wolden, C.A.; Ohno, T.; Woods, L. **Temperature Dependence of Growth Rate and Morphology of Vapor Transport Deposited CdTe Thin Films.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by Colorado School of Mines, Golden, Colorado; ITN Energy Systems, Littleton, Colorado.

Keyes, B.M.; Dipko, P.; Metzger, W.K.; AbuShama, J.; Noufi, R. **Changes in the Dominant Recombination Mechanisms of Polycrystalline Cu(In,Ga)Se₂ Occurring During Growth.** *Journal of Applied Physics*. 2003; 94(9): pp. 5584-5591.

King, R.R.; Sherif, R.A.; Fetzer, C.M.; Colter, P.C.; Cotal, H.L.; Paredes, A.; Edmondson, K.M.; Law, D.C.; Stavrides, A.P.; Yoon, H.; Kinsey, G.S.; Ermer, J.H.; Karam, N.H. **Advances in High-Efficiency Multijunction Terrestrial Concentrator Cells and Receivers.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by Spectrolab, Inc., Sylmar, California.

Kosteski, T.; Kherani, N.P.; Stradins, P.; Gaspari, F.; Shmayda, W.T.; Sidhu, L.S.; Zukotynski, S. **Tritiated Amorphous Silicon Betavoltaic Devices.** *IEEE Circuits, Devices and Systems*. 2003; 150(4): pp. 274-281.

Kosuarju, S.; Repins, I.; Wolden, C.A. **Development of Plasma-Assisted Processing for Selenization and Sulfurization of Absorber Layers.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by Colorado School of Mines, Golden, Colorado; ITN Energy Systems, Littleton, Colorado.

Kozyrev, A.; Buslov, O.; Keis, V.; Dovgan, D.; Kotelnikov, I.; Kulik, P.; Sengupta, L.; Chiu, L.; Treadway, B.; Kaydanova, T.; Perkins, J.D.; Alleman, J.; Ginley, D.S. **Procedures of Measurements of Ferroelectric Films Parameters in Frequency Range (20-60) GHz.** *Integrated Ferroelectrics*. 2003; 55: pp. 895-903.

Kozyrev, A.B.; Samoilova, T.B.; Shafranov, E.G.; Kaidanova, T.; Ginley, D.S.; Perkins, G.D.(sic); Alleman, J.; Sengupta, L.; Chiu, L.; Zhang, X. **Investigation of Ba_xSr_{1-x}TiO₃ Film-Based Transmission Line for Direct Phase Modulation of Microwave Carrier.** *Integrated Ferroelectrics*. 2003; 55: pp. 815-824.

Kurtz, S.; Geisz, J.F.; Friedman, D.J.; Metzger, W.K.; King, R.R.; Karam, N.H. **Annealing-Induced-Type Conversion of GaInNAs.** *Journal of Applied Physics*. 1 March 2004; 95(5): pp. 2505-2508.

Kurtz, S.; Moon, S. **Solar Electricity: Pie in the Sky Gets a Piece of the Action.** *Laser Focus World*. 2003; 39(9): 4 pp.

Li, X.; Gessert, T.A.; Coutts, T. **Properties of Cadmium Tin Oxide Thin-Film Compounds Prepared by Linear Combinatorial Synthesis.** Tsui, F. and Hewes, J., eds. *Applied Surface Science*. Proceedings of the Second Japan-US Workshop on Combinatorial Materials Science and Technology, 9-11 December 2002, Winter Park, Colorado. 15 February 2004; 223(1-3): pp. 138-143.

Li, Y.M.; Selvan, A.J.A.; Delahoy, A.E. **PECVD $\mu\text{-Si:H}$ Solar Cells Prepared in a Batch-Type Single Chamber Reactor.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by Energy Photovoltaics, Inc., Princeton, New Jersey.

Mason, T.O.; Chang, R.P.H.; Marks, T.J.; Poepfelmeier, K.R. [Improved Transparent Conducting Oxides for Photovoltaics: Final Research Report, 1 May 1999—31 December 2002.](#) October 2003; 18 pp. Work performed by Northwestern University, Evanston, Illinois. NREL/SR-520-34825.

Mason, T.O.; Kammler, D.R.; Ingram, B.J.; Gonzalez, G.B.; Young, D.L.; Coutts, T.J. **Key Structural and Defect Chemical Aspects of Cd-In-Sn-O Transparent Conducting Oxides.** Hosono, H., et al., eds. *Thin Solid Films*. Proceedings of the 3rd International Symposium on Transparent Oxide Thin Films for Electronics and Optics, 10-11 April 2003, Tokyo, Japan. 15 December 2003; 445(2): pp. 186-192.

McCabe, J.; Herig, C.; Hoff, T. **Chapter 10: The Value of Building Integrated Photovoltaics.** Goswami, D.Y., ed. *Advances in Solar Energy: An Annual Review of Research and Development, Volume 15*. Boulder, CO: American Solar Energy Society, Inc. (ASES), 2003; pp. 373-403.

McCandless, B.; Dobson, K.; Hegedus, S.; Paulson, P. **Role of Process Chemistry and Stability on CdTe-Based Solar Cell Performance.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by University of Delaware, Newark, Delaware.

Mooney, D.; Mitchell, R.; Witt, E.; King, R.; Ruby, D. [PV Manufacturing R&D Accomplishments and Status.](#) November 2003; 8 pp. NREL/TP-520-35278.

Morel, D.L.; Ferekides, C.S. [Advanced Processing of CdTe- and \$\text{CuIn}_{1-x}\text{Ga}_x\text{Se}_2\$ -Based Solar Cells: Final Technical Report, 26 May 1998—22 December 2001.](#) October 2003; 51 pp. Work performed by the University of South Florida, Tampa, Florida. NREL/SR-520-35092.

Moutinho, H.R.; Jiang, C.S.; Nelson, B.; Xu, Y.; Perkins, J.; To, B.; Jones, K.M.; Romero, M.J.; Al-Jassim, M.M. **Influence of Substrate Temperature and Hydrogen Dilution Ratio on the Properties of Nanocrystalline Silicon Thin Films Grown by Hot-Wire Chemical Vapor Deposition.** Abelson, J.R., et al., eds. *Amorphous and Nanocrystalline Silicon-Based Films—2003: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California.* Materials Research Society Symposium Proceedings, Vol. 762. Warrendale, PA: Materials Research Society, 2003; pp. 571-576. For preprint version, including full text online document, see [NREL/CP-520-33929](http://www.nrel.gov/publications/CP-520-33929).

Mueller, C.; Liao, D.X.; Rockett, A. **Cu(In,Ga)Se₂ Materials, Devices and Analysis for High Performance Devices.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM).* NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 2 pp. Work performed by University of Illinois, Urbana, Illinois.

Nampoothiri, A.V.V.; Nelson, B.P.; Dexheimer, S.L. **Femtosecond Far-Infrared Studies of Carrier Dynamics in Hydrogenated Amorphous Silicon and Silicon-Germanium Alloys.** Abelson, J.R., et al., eds. *Amorphous and Nanocrystalline Silicon-Based Films—2003: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California.* Materials Research Society Symposium Proceedings, Vol. 762. Warrendale, PA: Materials Research Society, 2003; pp. 333-337.

Ortabasi, U. **Broad Band Rugate Filters for High Performance Solar Electric Concentrators.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM).* NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 1 pp. Work performed by United Innovations, Inc., San Marcos, California.

Ostapenko, S.; Tarasov, I.; Lulu, S.; Belyaev, A.; Dybiec, M. **Scanning Photoluminescence in Si₃N₄ Antireflected Coating of me-Si.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM).* NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 3 pp. Work performed by University of South Florida, Tampa, Florida.

Osterwald, C.R. **Chapter IV-1: Standards, Calibration, and Testing of PV Modules and Solar Cells.** Markvart, T. and Castaner, L., eds. *Practical Handbook of Photovoltaics: Fundamentals and Applications.* Oxford, UK: Elsevier Science Ltd., 2003; pp. 793-816.

Owens, J.; Han, D.; Yan, B.; Yang, J.; Lord, K.; Guha, S. **Micro-Raman Measurements of Mixed-Phase Hydrogenated Silicon Solar Cells.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM).* NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 2 pp. Work performed by University of North Carolina at Chapel Hill, Chapel Hill, North Carolina; United Solar Systems Corp., Troy, Michigan.

Perkins, J.D.; Teplin, C.W.; van Hest, M.F.A.M.; Alleman, J.L.; Li, X.; Dabney, M.S.; Keyes, B.M.; Gedvilas, L.M.; Ginlkey, D.S.; Lin, Y.; Lu, Y. **Optical Analysis of Thin Film Combinatorial Libraries.** Tsui, F. and Hewes, J., eds. *Applied Surface Science*. Proceedings of the Second Japan-US Workshop on Combinatorial Materials Science and Technology, 9-11 December 2002, Winter Park, Colorado. 15 February 2004; 223(1-3): pp. 124-132.

Petrov, P.K.; Alford, N.M.; Astafiev, K.F.; Tagantsev, A.K.; Setter, N.; Kaydanova, T.; Ginley, D.S. **Structural Investigation of Thin SrTiO₃ Films Grown on MgO and LaAlO₃ Substrates.** *Integrated Ferroelectrics*. 2003; 53: pp. 465-473.

Powell, R.C.; Meyers, P.V. [Research Leading to High Throughput Processing of Thin-Film CdTe PV Module: Phase I Annual Report, October 2003 \(Revised\)](#). February 2004; 44 pp. Work performed by First Solar, LLC, Perrysburg, Ohio. NREL/SR-520-35348.

Ramanathan, K.; Hasoon, F.S.; Smith, S.; Young, D.L.; Contreras, M.A.; Johnson, P.K.; Pudov, A.O.; Sites, J.R. **Surface Treatment of CuInGaSe₂ Thin Films and Its Effect on the Photovoltaic Properties of Solar Cells.** *Journal of Physics and Chemistry of Solids*. 2003; 64: pp. 1495-1498. For preprint version, including full text online document, see [NREL/CP-520-32950](#).

Rand, J.A.; Culik, J.S. **APex™ Solar Cell Manufacturing.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 3 pp. Work performed by AstroPower, Inc., Newark, Delaware.

Ravindra, N.M.; Ravindra, K.; Mahendra, S.; Sopori, B.; Fiory, A.T. **Modeling and Simulation of Emissivity of Silicon-Related Materials and Structures.** *Journal of Electronic Materials*. 2003; 32(10): pp. 1052-1058.

Reason, M.; Ye, W.; Weng, X.; Obeidi, G.; Rotberg, V.; Goldman, R.S. **Stress Evolution in GaAsN Films Grown by Reactive Molecular Beam Epitaxy.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by University of Michigan, Ann Arbor, Michigan.

Repins, I.; Wolden, C. [Plasma-Assisted Coevaporation of S and Se for Wide Band Gap Chalcopyrite Photovoltaics: Phase II Annual Report, December 2002—December 2003](#), January 2004; 23 pp. Work performed by ITN Energy Systems, Inc., Littleton, Colorado and Colorado School of Mines, Golden, Colorado. NREL/SR-520-35515.

Repins, I.L.; Batchelor, W.; Fisher, D.; Beck, M. **Three-Stage CIGS Process Tolerance.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by ITN Energy Systems, Inc., Littleton, Colorado; Global Solar Energy, Inc., Tucson, Arizona.

Repins, I.L.; Ribelin, R.; Gonzalez, D.; Beck, M. **Alternate Window Layer Processing for CIGS on Flexible Substrates**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by ITN Energy Systems, Inc., Littleton, Colorado; Global Solar Energy, Inc., Tucson, Arizona.

Ringel, S.A.; Andre, C.L.; Boeckl, J.; Gonzalez, M.; Hudait, M.K.; Wilt, D.M.; Clark, E.B.; Smith, M. **Advances in III-V Compounds and Solar Cells Grown on SiGe Substrates**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by Ohio State University, Columbus, Ohio; NASA Glenn Research Center, Cleveland, Ohio.

Romero, M.J.; Jones, K.M.; AbuShama, J.; Yan, Y.; Al-Jassim, M.M.; Noufi, R. **Surface-Layer Band Gap Widening in Cu(In,Ga)Se₂ Thin Films**. *Applied Physics Letters*. 2003; 83(23): pp. 4731-4733.

Romero, M.J.; Ramanathan, K.; Contreras, M.A.; Al-Jassim, M.M.; Noufi, R.; Sheldon, P. **Cathodoluminescence of Cu(In,Ga)Se₂ Thin Films Used in High-Efficiency Solar Cells**. *Applied Physics Letters*. 2003; 83(23): pp. 4770-4772.

Shafarman, W.; Titus, J.; Haimbodi, M.; Gossia, M.; Hanket, G.; Marsillac, S.; Minemoto, T.; Paulson, P.; Sang, B.; Singh, U.; Eser, E.; Birkmire, R. **Advances in CuInSe₂-Based Solar Cells: From Fundamentals to Processing**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by University of Delaware, Newark, Delaware.

Shvydka, D.; Gupta, A.; Karpov, V.G.; Compaan, A.D. **Mostly Nonuniformity Issues in Thin-Film PV**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by University of Toledo, Toledo, Ohio.

Simpson, L. [Trajectory Oriented and Fault Tolerant Based Intelligent Process Control for Flexible CIGS PV Module Manufacturing: Phase 1 Final Technical Report, March 2003](#). February 2004; 39 pp. Work performed by ITN Energy Systems, Inc., Littleton, Colorado. NREL/SR-520-35146.

Simpson, L.J.; Britt, J.S.; Wiedeman, S.; Beck, M.E.; Joshi, B.S.; Vincent, T.L.; Delplanque, J.P.; Kee, R.J.; Gomez, N.B.; Williams, K.M.; Hanna, J.; Hilt, M.J.; Huntington, R.B.; Musbah, O.A.; VanAlsburg, J.M. **Process Control Advancements for Flexible CIGS PV Module Manufacturing**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 6 pp. Work performed by ITN Energy Systems, Inc., Littleton, Colorado; Global Solar Energy, Inc., Tucson, Arizona; Colorado School of Mines, Golden, Colorado.

Sinton, R.A. [Development of an In-Line Minority-Carrier Lifetime Monitoring Tool for Process Control during Fabrication of Crystalline Silicon Solar Cells: Annual Subcontract Report, June 2003.](#) March 2004; 28 pp. Work performed by Sinton Consulting, Inc., Boulder, Colorado. NREL/SR-520-35884.

Sinton, R.A. **Measuring and Monitoring Electronic Properties of Si During Industrial Material Preparation and Cell Fabrication.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by Sinton Consulting, Inc., Boulder, Colorado.

Song, J.; Li, S.S.; Huang, C.H.; Anderson, T.J.; Crisalle, O.D. **Modeling and Simulation of a CGS/CIGS Tandem Solar Cell.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 3 pp. Work performed by University of Florida, Gainesville, Florida.

Sopori, B. **Silicon Nitride Coatings for Si Solar Cells: Control of Optical Reflection and Surface/Bulk Passivation.** *Dielectrics in Emerging Technologies: Proceedings of the 203rd Electrochemical Society Meeting, 27 April 2003, Paris, France*. Electrochemical Society Proceedings, Vol. 2003-01. Pennington, NJ: Electrochemical Society, 2003; pp. 186-200.

Sopori, B. **Silicon Nitride Processing for Control of Optical and Electronic Properties of Silicon Solar Cells.** *Journal of Electronic Materials*. 2003; 32(10): pp. 1034-1042.

Sopori, B.; Sinton, R.; Tan, T.; Swanson, D. [13th Workshop on Crystalline Silicon Solar Cell Materials and Processes: Summary Discussion, 10-13 August 2003, Vail, Colorado.](#) January 2004; 16 pp. NREL/CP-520-35435.

Stan, M.; Aiken, D.; Hills, J.; Sharps, P.; James, L.; Gordon, R.; Slade, A.; Stone, K.; Turner, G. **Progress Report on the Integration of the Emcore Triple-Junction Solar Cell into a High Concentration Ratio Fresnel Lens-Based Receiver.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 3 pp. Work performed by Emcore Photovoltaics, Albuquerque, New Mexico; James Associates, Nederland, Colorado; and Amonix, Inc., Torrance, California.

Starrs, T.; Wenger, H. [Consumer's Guide: Get Your Power from the Sun \(Brochure\).](#) December 2003; 20 pp. DOE/GO-102003-1844.

Stavola, M.; Jiang, F.; Estreicher, S.K.; McAfee, J.L.; Rohatgi, A.; Kim, D.; Holt, J.; Atwater, H.; Kalejs, J. **Hydrogenation of Bulk Si from SiN_x:H Films: What Really Ends Up in the Si?** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by Lehigh University, Bethlehem, Pennsylvania; Texas Tech University, Lubbock, Texas; Georgia Institute of Technology, Atlanta, Georgia; California Institute of Technology, Pasadena, California; and RWE Schott Solar, Inc., Billerica, Massachusetts.

Stradins, P.; Jackson, W.B.; Branz, H.M.; Hu, J.; Perkins, C.L.; Wang, Q. **Time-Resolved Switching Studies in a-Si:H and Related Films.** Abelson, J.R., et al., eds. *Amorphous and Nanocrystalline Silicon-Based Films—2003: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 762. Warrendale, PA: Materials Research Society, 2003; pp. 75-80.

Su, T.; Taylor, P.C.; Ganguly, G.; Carlson, Jr.D.E. **Paired Hydrogen Site and the Staebler-Wronski Effect in Hydrogenated Amorphous Silicon.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 3 pp. Work performed by University of Utah, Salt Lake City, Utah; and BP Solar, Toano, Virginia.

Sutter, E.; Williamson, D.L.; Marr, D.W.M. **Microstructure Studies of Amorphous and Microcrystalline Silicon-Based Solar Cell Materials.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 3 pp. Work performed by Colorado School of Mines, Golden, Colorado.

Tarrant, D.E.; Gay, R.R. [Process R&D for CIS-Based Thin-Film PV: Annual Technical Report, 24 April 2002—23 April 2003.](#) March 2004; 36 pp. Work performed by Shell Solar Industries, Camarillo, California. NREL/SR-520-35684.

Taylor, M.P.; Readey, D.W.; Teplin, C.W.; van Hest, M.F.A.M.; Alleman, J.L.; Dabney, M.S.; Gedvilas, L.M.; Keyes, B.M.; To, B.; Parilla, P.A.; Perkins, J.D.; Ginley, D.S. **Combinatorial Growth and Analysis of the Transparent Conducting Oxide ZnO/In (IZO).** *Macromolecular Rapid Communications*. January 2004; 25(1): pp. 344-347.

Teplin, C.W.; van Hest, M.F.A.M.; Dabney, M.; Perkins, C.L.; Gedvilas, L.M.; To, B.; Parilla, P.A.; Keyes, B.M.; Perkins, J.D.; Ginley, D.S.; Lin, Y.; Lu, Y. **Combinatorial Study of Reactively Sputtered Cr-Ti-N.** Tsui, F. and Hewes, J., eds. *Applied Surface Science*. Proceedings of the Second Japan-US Workshop on Combinatorial Materials Science and Technology, 9-11 December 2002, Winter Park, Colorado. 15 February 2004; 223(1-3): pp. 253-258.

Volltrauer, H. [Productivity Enhancement for Manufacturing of Amorphous Silicon PV Modules: Final Technical Report, 1 July 2002—30 June 2003.](#) November 2003; 49 pp. Work performed by Energy Photovoltaics, Inc., Lawrenceville, New Jersey. NREL/SR-520-35147.

von Roedern, B.G.; Meek, T.T.; Haire, M.J. **Some Electrical Properties of Ion-Implanted Urania—Part II.** Cohen, L.J.; Ong, C.L., and Arendt, C.P., eds. *Advancing Materials in the Global Economy—Applications, Emerging Markets and Evolving Technologies*. Proceedings of the 48th International SAMPE Symposium, 11-15 May 2003, Long Beach, California. Covina, CA: Society for the Advancement of Material and Process Engineering (SAMPE), 2003; pp. 1844-1854. For preprint version including online full-text document, see [NREL/CP-520-33441.](#)

Voyles, P.M.; Abelson, J.R. [Medium-Range Order in Amorphous Silicon Measured by Fluctuation Electron Microscopy: Final Report, 23 June 1999—23 August 2002.](#) October 2003; 36 pp. Work performed by the University of Illinois at Urbana-Champaign, Urbana, Illinois. NREL/SR-520-34826.

Wang, J.; Curtis, C.J.; Schulz, D.L.; Zhang, J.G. **Influences of Treatment Temperature and Water Content on Capacity and Rechargeability of V₂O₅ Xerogel Films.** *Journal of the Electrochemical Society*. 2004; 151(1): pp. A1-A7.

Wang, Q.; Liu, F.; Han, D. **High-Throughput Chemical Vapor Deposition System and Thin-Film Silicon Library.** *Macromolecular Rapid Communications*. January 2004; 25(1): pp. 326-329.

Wang, Q.; Shaheen, S.E. **Hybrid Organic-Inorganic Photoconductive Diode.** *Applied Physics Letters*. 2003; 83(16): pp. 3404-3406.

Wang, Q.; Tessler, L.R.; Moutinho, H.; To, B.; Perkins, J.; Han, D.; Ginley, D.; Branz, H.M. **Combinatorial Approach to Thin-Film Silicon Materials and Devices.** Abelson, J.R., et al., eds. *Amorphous and Nanocrystalline Silicon-Based Films—2003: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 762. Warrendale, PA: Materials Research Society, 2003; pp. 413-424. For preprint version, including full text online document, see [NREL/CP-520-33070.](#)

Wang, Q.; Ward, S.; Gedvilas, L.; Keyes, B.; Sanchez, E.; Wang, S. **Conformal Thin-Film Silicon Nitride Deposited by Hot-Wire Chemical Vapor Deposition.** *Applied Physics Letters*. 19 January 2004; 84(3): pp. 338-340.

Wang, X.; Li, S.S.; Huang, C.H.; Kerr, L.L.; Rawal, S.; Howard, J.M.; Craciun, V.; Anderson, T.J.; Crisalle, O.D.; Singh, R.K. **Investigation of Pulsed Non-Melt Laser Annealing (NLA) of CIGS-Based Solar Cells.** *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by University of Florida, Gainesville, Florida.

Williamson, D.L. [Structure of Silicon-Based Thin Film Solar Cell Materials: Annual Technical Progress Report, 1 April 2002—31 August 2003](#). January 2004; 77 pp. Work performed by the Colorado School of Mines, Golden, Colorado. NREL/SR-520-35227.

Wohlgemuth, J.; Shea, S.P. [Large-Scale PV Module Manufacturing Using Ultra-Thin Polycrystalline Silicon Solar Cells: Annual Subcontract Report, 1 April 2002—30 September 2003](#). February 2004; 55 pp. Work performed by BP Solar, Frederick, Maryland. NREL/SR-520-35887.

Wohlgemuth, J.H.; Shea, S.P. **PVMaT Improvements in BP Solar Large-Scale PV Module Manufacturing Using Ultra-Thin Multicrystalline Silicon Solar Cells**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 2 pp. Work performed by BP Solar, Frederick, Maryland.

Wronski, C.R.; Collins, R.W.; Pearce, J.M.; Deng, J.; Vlahos, V.; Ferreira, G.M.; Chen, C. **Optimization of Phase-Engineered a-Si:H-Based Multijunction Solar Cells**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by Pennsylvania State University, University Park, Pennsylvania.

Wu, C.; Chen, Y.; Li, J.; Yang, G.; Yang, H.; Zhou, Z.; Zhao, Y.; Meng, Z.; Geng, X.; Xiong, S.; Zhang, L.; Wang, Q. **Numerical Simulation of the Influence of the Gap State of a-Si:H on the Characteristics of a-Si:H p-i-n/OLED Coupling Device**. Abelson, J.R., et al., eds. *Amorphous and Nanocrystalline Silicon-Based Films—2003: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 762. Warrendale, PA: Materials Research Society, 2003; pp. 223-228.

Wu, J.; Walukiewicz, W.; Yu, K.M.; Shan, W.; Ager III, J.W.; Haller, E.E.; Lu, H.; Schaff, W.J.; Metzger, W.K.; Kurtz, S. **Superior Radiation Resistance of $\text{In}_{1-x}\text{Ga}_x\text{N}$ Alloys: A Full-Solar-Spectrum Photovoltaic Material System**. *Journal of Applied Physics*. 2003; 94(10): pp. 6477-6482.

Xu, Y.; Nelson, B.P.; Williamson, D.L.; Gedvilas, L.M.; Reedy, R.C. **Influence of Filament and Substrate Temperatures on Structural and Optoelectronic Properties of Narrow Gap a-SiGe:H Alloys Deposited by Hot-Wire CVD**. Abelson, J.R., et al., eds. *Amorphous and Nanocrystalline Silicon-Based Films—2003: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 762. Warrendale, PA: Materials Research Society, 2003; pp. 455-460. For preprint version, including full text online document, see [NREL/CP-520-33936](#).

Yan, B.; Yang, J.; Guha, S. **Hydrogenated Microcrystalline Silicon Solar Cells Using Microwave Glow Discharge**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by United Solar Systems Corp., Troy, Michigan.

Yan, Y.; Al-Jassim, M.M. **Adsorption of Water Molecules on the CdTe(001) Surface**. *Surface Science*. 2003; 545: pp. 34-40.

Yan, Y.; Jones, K.M.; Wu, X.; Al-Jassim, M.M. **Formation of Cd_xHg_{1-x}Te Layers on CdTe after NP-Etching and HgTe-Graphite Pasting**. Noufi, R., et al., eds. *Compound Semiconductor Photovoltaics: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 763. Warrendale, PA: Materials Research Society, 2003; pp. 119-124. NREL/CP-520-33952.

Yang, J.; Yan, B.; Yue, G.; Banerjee, A.; Lord, K.; Guha, S. **Status of Hydrogenated Microcrystalline Silicon Solar Cells at United Solar**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 2 pp. Work performed by United Solar, Troy, Michigan.

Yaskoff, J.; DelleDonne, E.; Ford, D.; Ingram, A.; Jonczyk, R.; Sims, P.; Rand, J.; Barnett, A. **Thin Silicon-On-Ceramic Solar Cells**. *NCPV and Solar Program Review Meeting Proceedings, 24-26 March 2003, Denver, Colorado (CD-ROM)*. NREL/CD-520-33586. Golden, CO: National Renewable Energy Laboratory, 2003; 4 pp. Work performed by AstroPower, Inc., Newark, Delaware.

Young, D.L.; Crandall, R.S. **Electrostatic Barrier to Trap Filling in CuIn_{1-x}Ga_xSe₂**. *Applied Physics Letters*. 2003; 83(12): pp. 2363-2365.

Young, D.L.; Keane, J.; Duda, A.; AbuShama, J.A.M.; Perkins, C.L.; Romero, M.; Noufi, R. **Improved Performance in ZnO/CdS/CuGaSe₂ Thin-Film Solar Cells**. *Progress in Photovoltaics: Research and Applications*. December 2003; 11(8): pp. 535-541.

Young, D.L.; Ramanathan, K.; Contreras, M.; Abushama, J.; Crandall, R.S. **Barrier to Trap Filling in CuIn_{1-x}Ga_xSe₂**. Noufi, R., et al., eds. *Compound Semiconductor Photovoltaics: Proceedings of the Materials Research Society Symposium, 22-25 April 2003, San Francisco, California*. Materials Research Society Symposium Proceedings, Vol. 763. Warrendale, PA: Materials Research Society (MRS), 2003; pp. 249-254. For preprint version including online full-text document, see [NREL/CP-520-33953](http://www.nrel.gov/pv/docs/CP-520-33953).

Yu, K.M.; Wu, J.; Walukiewicz, W.; Shan, W.; Beeman, J.W.; Mars, D.E.; Chamberlin, D.R.; Scarpulla, M.A.; Dubon, O.D.; Ridgway, M.C.; Geisz, J.F. **Mutual Passivation of Group IV Donors and Inovalent Nitrogen in Diluted GaN_xAs_{1-x} Alloys**. Nielsen, K.B.; Larsen, A. N., and Weyer, G., eds. *Physica B: Condensed Matter*. Proceedings of the 22nd International Conference on Defects in Semiconductors, 28 July–1 August 2003, Aarhus, Denmark. 31 December 2003; 340-342: pp. 389-393.

Solar Energy—Radiation

Myers, D.R.; Emery, K.; Gueymard, C. **Revising and Validating Spectral Irradiance Reference Standards for Photovoltaic Performance Evaluation.** *Journal of Solar Energy Engineering. Transactions of the ASME.* February 2004; 126(1): pp. 567-574.

Solar Energy—Thermal

[Assessment of Parabolic Trough and Power Tower Solar Technology Cost and Performance Forecasts.](#) October 2003; 344 pp. Work performed by Sargent and Lundy LLC Consulting Group, Chicago, Illinois. NREL/SR-550-34440.

[Executive Summary: Assessment of Parabolic Trough and Power Tower Solar Technology Cost and Performance Forecasts.](#) October 2003; 47 pp. Work performed by Sargent and Lundy LLC Consulting Group, Chicago, Illinois. NREL/SR-550-35060.

[International Solar Concentrator Conference for the Generation of Electricity or Hydrogen \(CD-ROM\).](#) January 2004; NREL/CD-520-35349.

Forristall, R. [Heat Transfer Analysis and Modeling of a Parabolic Trough Solar Receiver Implemented in Engineering Equation Solver.](#) October 2003; 164 pp. NREL/TP-550-34169.

Kutscher, C.; Christensen, C.; Gawlik, K. **In Response to “A Field Study of the Wind Effects on the Performance of an Unglazed Transpired Solar Collector”.** *Solar Energy*. 2003; 74: pp. 353-354.

Schwer, R.K.; Riddel, M. [Potential Economic Impact of Constructing and Operating Solar Power Generation Facilities in Nevada.](#) February 2004; 28 pp. Work performed by University of Nevada, Las Vegas, Nevada. NREL/SR-550-35037.

Solid State Spectroscopy

Karazhanov, S.Zh.; Zhang, Y.; Mascarenhas, A.; Deb, S.; Wang, L.W. **Oxygen Vacancy in Cubic WO₃ Studied by First-Principles Pseudopotential Calculation.** *Solid State Ionics*. 2003; 165: pp. 43-49.

Lee, S.H.; Cheong, H.M.; Seong, M.J.; Liu, P.; Tracy, C.E.; Mascarenhas, A.; Pitts, R.J.; Deb, S.K. **Raman Spectroscopic Studies of Amorphous Vanadium Oxide Thin Films.** *Solid State Ionics*. 2003; 165: pp. 111-116.

Smith, S.; Mascarenhas, A.; Ahrenkiel, S.P.; Hanna, M.C.; Olson, J.M. **Spatially Resolved Below-Gap Emission in Partially Ordered Ga_xIn_{1-x}P Alloys.** Article No. 035310. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(03): 7 pp.

Smith, S.; Mascarenhas, A.; Olson, J.M. **Magnetophotoluminescence of Quantum Confined States in Ordered Ga_xIn_{1-x}P with 200 Nanometer Resolution.** Article No. 153203. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(15): 4 pp.

Yoon, S.; Seong, M.J.; Geisz, J.F.; Duda, A.; Mascarenhas, A. **Evolution of Electronic States in GaP_{1-x}N_x Studied by Resonant Raman Scattering Spectroscopy.** Article No. 235209. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 67(23): 4 pp.

Zhang, Y.; Fluegel, B.; Hanna, M.C.; Geisz, J.F.; Wang, L.-W.; Mascarenhas, A. **Effects of Heavy Nitrogen Doping in III—V Semiconductors—How Well Does the Conventional Wisdom Hold for the Dilute Nitrogen “III—V-N Alloys?”** *Physica Status Solidi B—Basic Research*. 2003; 240(2): pp. 396-403.

Zhang, Y.; Fluegel, B.; Hanna, M.C.; Mascarenhas, A.; Wang, L.W.; Wang, Y.J.; Wei, X. **Impurity Perturbation to the Host Band Structure and Recoil of the Impurity State.** Article No. 075210. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(07): 4 pp.

Zhang, Y.; Fluegel, B.; Mascarenhas, A. **Total Negative Refraction in Real Crystals for Ballistic Electrons and Light.** Article No. 157404. *Physical Review Letters*. 2003; 91(15): 4 pp.

Solid State Theory

Bester, G.; Zunger, A. **Compositional and Size-Dependent Spectroscopic Shifts in Charged Self-Assembled $\text{In}_x\text{Ga}_{1-x}\text{As}/\text{GaAs}$ Quantum Dots.** Article No. 073309. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(07): 4 pp.

Blum, V.; Zunger, A. **Structural Complexity in Binary bcc Ground States: The Case of bcc Mo-Ta.** Article No. 020103. *Physical Review. B, Condensed Matter and Materials Physics*. 2004; 69(2): 4 pp.

Califano, M.; Bester, G.; Zunger, A. **Prediction of a Shape-Induced Enhancement in the Hole Relaxation in Nanocrystals.** *Nano Letters*. 2003; 3(9): pp. 1197-1202.

Jaffé, J.E.; Zunger, A. **Defect-Induced Nonpolar-to-Polar Transition at the Surface of CuInSe_2 .** *Journal of Physics and Chemistry of Solids*. 2003; 64: pp. 1547-1552.

Kilic, C.; Zunger, A. **Doping of Chalcopyrites by Hydrogen.** *Applied Physics Letters*. 2003; 83(10): pp. 2007-2009.

Kilic, C.; Zunger, A. **n-Type Doping and Passivation of CuInSe_2 and CuGaSe_2 by Hydrogen.** Article No. 075201. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(07): 10 pp.

Lincot, D.; Zunger, A. **Forward to: ICTMC.** *Journal of Physics and Chemistry of Solids*. 2003; 64: pp. 1435-1436.

Magri, R.; Zunger, A. **Predicting Interband Transition Energies for InAs/GaSb Superlattices using the Empirical Pseudopotential Method.** Article No. 155329. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(15): 8 pp.

Magri, R.; Zunger, A. **Theory of Optical Properties of 6.1 \AA III—V Superlattices: The Role of the Interfaces.** *Journal of Vacuum Science and Technology. Part B, Microelectronics and Nanometer Structures*. 2003; 21(4): pp. 1896-1902.

Magri, R.; Zunger, A. **Theory of Optical Properties of Segregated InAs/GaSb Superlattices.** *IEE Proceedings—Optoelectronics*. 2003; 150(4): pp. 409-414.

Mahadevan, P.; Zunger, A. **Ferromagnetism in Mn-Doped GaAs Due to Substitutional-Interstitial Complexes.** Article No. 075202. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(07): 8 pp.

Persson, C.; Zunger, A. **Anomalous Grain Boundary Physics in Polycrystalline CuInSe₂: The Existence of a Hole Barrier.** Article No. 266401. *Physical Review Letters*. 31 December 2003; 91(26): 4 pp.

Persson, C.; Zunger, A. **Deep Nitrogen-Induced Valence- and Conduction-Band States in GaAs_{1-x}N_x.** Article No. 035212. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(03): 5 pp.

Persson, C.; Zunger, A. **S-D Coupling in Zinc-Blende Semiconductors.** Article No. 073205. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(07): 4 pp.

Sanati, M.; Hart, G.L.W.; Zunger, A. **Ordering Tendencies in Octahedral MgO-ZnO Alloys.** Article No. 155210. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(15): 5 pp.

Wang, L.G.; Zunger, A. **Dilute Nonisovalent (II-VI)-(III-V) Semiconductor Alloys: Monodoping, Codoping, and Cluster Doping in ZnSe-GaAs.** Article No. 125211. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(12): 8 pp.

Zunger, A. **Practical Doping Principles.** *Applied Physics Letters*. 7 July 2003; 83(1): pp. 57-59.

Superconductivity

Bhattacharya, R.N.; Chen, J.; Spagnol, P.; Huang, J.Y.; Ren, Z.F. **Superconductor Bi-Oxide Films via an Electrodeposition Process.** *Superconductor Science and Technology*. 2004; 17(1): pp. 120-124.

Chen, J.; Bhattacharya, R.N. **Growth of 1-2 μm Thick Biaxially Textured Bi-2212 Films on (100) LaAlO_3 Single Crystal Substrates by Electrodeposition.** *Physica C*. 2003; 399: pp. 171-177.

Janotti, A.; Wei, S.H.; Zhang, S.B. **Donor-Donor Binding in Semiconductors: Engineering Shallow Donor Levels for ZnTe.** *Applied Physics Letters*. 2003; 83(17): pp. 3522-3524.

Kaydanova, T.; Perkins, J.D.; Alleman, J.; Prudan, A.M.; Gaidukov, M.M.; Ginley, D.S. **Improved Performance in BST-Based Tunable Circuits Employing Low-Loss Nontunable Dielectric.** *Integrated Ferroelectrics*. 2003; 56: pp. 1075-1085.

Prudan, A.; Kozyrev, A.; Zemtsov, A.; Osadchy, V.; Ginley, D.; Kaydanova, T.; Perkins, J.D.; Alleman, J.; Sengupta, L.; Chiu, L.; Zhang, X. **Conservation of Permittivity and Tunability of Ferroelectrics Over Temperature.** *Integrated Ferroelectrics*. 2003; 58: pp. 1337-1345.

Segev, D.; Wei, S.H. **Effects of Covalency, p-d Coupling, and Epitaxial Strain on the Band Offsets of II-VI Semiconductors.** Article No. 165336. *Physical Review. B, Condensed Matter and Materials Physics*. 2003; 68(16): 5 pp.

Transportation

[Alternative Fuel News, Vol. 7, No. 3.](#) November 2003; 16 pp. NREL/BR-540-34708.

[Alternative Fuels and Advanced Vehicle Technologies: Information Resources \(Brochure\).](#) February 2004; 6 pp. DOE/GO-102004-1840.

[City of Los Angeles Bureau of Sanitation.](#) Advanced Technology Vehicles in Service: LNG Heavy-Duty Trucks (Fact Sheet). February 2004; 2 pp. DOE/GO-102004-1842.

[Clean Cities Fact Sheet.](#) January 2004; 4 pp. DOE/GO-102004-1867.

[Demonstration of a Low-NO_x Heavy-Duty Natural Gas Engine.](#) Natural Gas Engine and Vehicle Research & Development (Fact Sheet). February 2004; 2 pp. DOE/GO-102004-1843.

[Fuel Cell Transit Buses: ThunderPower Bus Evaluation at SunLine Transit Agency.](#) November 2003; 22 pp. DOE/GO-102003-1786.

[Heavy Vehicle and Engine Resource Guide.](#) March 2004; 40 pp. DOE/GO-102004-1866.

[Vehicle Buyer's Guide for Fleets: Clean Cities Tools and Resources \(Fact Sheet\).](#) October 2003; 2 pp. DOE/GO-102003-1793.

[What's New: Fall 2003 Update.](#) EPA Fleet Information and Regulations, State and Alternative Fuel Provider Regulations Newsletter. November 2003; 4 pp. DOE/GO-102003-1780.

Cadle, S.H.; Croes, B.E.; Minassian, F.; Natarajan, M.; Tierney, E.J.; Lawson, D.R. **Real-World Vehicle Emissions: A Summary of the Thirteenth Coordinating Research Council On-Road Vehicle Emissions Workshop.** *Journal of the Air and Waste Management Association.* January 2004; 54(1): pp. 8-23.

Chinkin, L.R.; Coe, D.L.; Funk, T.H.; Hafner, H.R.; Roberts, P.T.; Ryan, P.A.; Lawson, D.R. **Weekday Versus Weekend Activity Patterns for Ozone Precursor Emissions in California's South Coast Air Basin.** *Journal of the Air and Waste Management Association.* July 2003; 53: pp. 829-843.

Eudy, L.; Gifford, M. [Challenges and Experiences with Electric Propulsion Transit Buses in the United States.](#) November 2003; 40 pp. DOE/GO-102003-1791. NREL/TP-540-34323.

Fanick, E.R. [Fuel and Fuel Additive Registration Testing of Ethanol-Diesel Blend for O₂Diesel, Inc.](#) February 2004; 44 pp. Work performed by Southwest Research Institute, San Antonio, Texas; O₂Diesel, Inc., Newark, Delaware. NREL/SR-540-35334.

Haraldsson, K.; Wipke, K. **Evaluating PEM Fuel Cell System Models.** *Journal of Power Sources.* 16 February 2004; 126(1-2): pp. 88-97.

Hovland, V.; Pesaran, A.; Mohring, R.M.; Eason, I.A.; Smith, G.M.; Tran, D.; Schaller, R.; Smith, T. **Water and Heat Balance in a Fuel Cell Vehicle with a Sodium Borohydride Hydrogen Fuel Processor.** *Fuel Cells: Technology, Alternative Fuels, and Fuel Processing. Proceedings of the International Future Transportation Technology Conference, 23-25 June 2003, Costa Mesa, California.* Society of Automotive Engineers (SAE) (Special Publication) SP-1790. Warrendale, PA: Society of Automotive Engineers, 2003; pp. 85-89.

Kelly, K.; Vlahinos, A.; Rodriguez, P.; Bharathan, D. **Innovative Thermal Management of Fuel Cell Power Electronics.** (FUELCELL2003-1745). Shah, R.K., ed. *Fuel Cell Science, Engineering and Technology: Proceedings of the First International Conference, 21-23 April 2003, Rochester, New York.* New York: The American Society of Mechanical Engineers (ASME), 2003; pp. 395-402.

Lawson, D.R. **Weekend Ozone Effect—The Weekly Ambient Emissions Control Experiment.** *EM: Air and Waste Management Association's Magazine for Environmental Managers.* July 2003: pp. 17-25.

MacBain, J.A.; Conover, J.J.; Brooker, A.D. **Full Vehicle Simulation for Series Hybrid Vehicles.** *Hybrid Vehicle and Energy Storage Technologies: SP-1789.* Warrendale, PA: Society of Automotive Engineers, 2003; pp. 101-108.

Morris, G. [Status of Biomass Power Generation in California, July 31, 2003.](#) December 2003; 34 pp. Work performed by Green Power Institute, Oakland, California. NREL/SR-540-35114.

Rajagopalan, A.; Washington, G.; Rizzoni, G.; Guezennec, Y. [Development of Fuzzy Logic and Neural Network Control and Advanced Emissions Modeling for Parallel Hybrid Vehicles.](#) December 2003; 50 pp. Work performed by The Ohio State University, Columbus, Ohio. NREL/ SR-540-32919.

Vlahinos, A.; Kelly, K.; D'Aleo, J.; Stathopoulos, J. **Effect of Material and Manufacturing Variations on Membrane Electrode Assembly Pressure Distribution.** (FUELCELL2003-1707). Shah, R.K., ed. *Fuel Cell Science, Engineering and Technology: Proceedings of the First International Conference, 21-23 April 2003, Rochester, New York.* New York: The American Society of Mechanical Engineers (ASME), 2003; pp. 111-120.

Waterland, L.R.; Venkatesh, S.; Unnasch, S. [Safety and Performance Assessment of Ethanol/Diesel Blends \(E-Diesel\).](#) September 2003; 48 pp. Work performed by TIAX LLC, Cupertino, California. NREL/SR-540-34817.

Wipke, K.; Chintawar, P.; Weller, R.; Willis, G. **Engineering System for Automated Design and Optimization of Fuel Cell Powered Vehicles.** (FUELCELL2003-1752). Shah, R.K., ed. *Fuel Cell Science, Engineering and Technology: Proceedings of the First International Conference, 21-23 April 2003, Rochester, New York.* New York: The American Society of Mechanical Engineers (ASME), 2003; pp. 449-454.

Wind Energy

[NAWIG News: The Quarterly Newsletter of the Native American Wind Interest Group, Spring 2004.](#) March 2004; 4 pp. DOE/GO-102004-1848.

[NAWIG News: The Quarterly Newsletter of the Native American Wind Interest Group, Winter 2003.](#) November 2003; 4 pp. DOE/GO-102003-1796.

[School Wind Energy Project Ideas for Supplemental Environmental Project \(SEP\) Settlements.](#) October 2003; 2 pp. DOE/GO-102003-1795.

[Small Wind Electric Systems: An Iowa Consumer's Guide.](#) October 2003; 28 pp. DOE/GO-102002-1634.

[Wind Energy Finance \(WEF\): An Online Calculator for Economic Analysis of Wind Projects.](#) February 2004; 6 pp. DOE/GO-102004-1846.

[Wind Power Today and Tomorrow.](#) March 2004; 36 pp. DOE/GO-102004-1894.

Cotrell, J.; Pratt, W. [Modeling the Feasibility of Using Fuel Cells and Hydrogen Internal Combustion Engines in Remote Renewable Energy Systems.](#) September 2003; 23 pp. NREL/TP-500-34648.

Fingersh, L.J.; Johnson, K.E. [Baseline Results and Future Plans for the NREL Controls Advanced Research Turbine: Preprint.](#) November 2003; 10 pp. NREL/CP-500-35058.

Hand, M.M. [Mitigation of Wind Turbine/Vortex Interaction Using Disturbance Accommodating Control.](#) December 2003; 125 pp. NREL/TP-500-35172.

Hand, M.M.; Robinson, M.C.; Balas, M.J. [Wind Turbine Response to Analytic Inflow Vortex Parameters Variation: Preprint.](#) November 2003; 13 pp. NREL/CP-500-34297.

Johnson, K.E.; Fingersh, L.J.; Balas, M.J.; Pao, L.Y. [Methods for Increasing Region 2 Power Capture on a Variable Speed HAWT: Preprint.](#) November 2003; 14 pp. NREL/CP-500-34979.

Jonkman, J.; van Dam, J.; Forsyth, T.; Davis, D. **Investigation of the IEC Safety Standard for Small Wind Turbine Design Through Modeling and Testing.** *Collection of the 2003 ASME Wind Energy Symposium Technical Papers at the 41st AIAA Aerospace Sciences Meeting and Exhibit, 6-9 January 2003, Reno, Nevada.* New York: American Institute of Aeronautics and Astronautics, Inc. (AIAA) and American Society of Mechanical Engineers (ASME), 2003; pp. 340-350. For preprint version, including full text online document, see [NREL/CP-500-33004](#).

Jonkman, J.M. [Modeling of the UAE Wind Turbine for Refinement of FAST AD.](#) December 2003; 184 pp. NREL/TP-500-34755.

Jonkman, J.M.; Buhl, M.L., Jr. [New Developments for the NWTC's FAST Aeroelastic HAWT Simulator: Preprint.](#) October 2003; 14 pp. NREL/CP-500-35077.

Kelley, N.; Shirazi, M.; Jager, D.; Wilde, S.; Adams, J.; Buhl, M.; Sullivan, P.; Patton, E. [Lamar Low-Level Jet Program Interim Report.](#) January 2004; 216 pp. NREL/TP-500-34593.

Kottenstette, R.; Cotrell, J. [Hydrogen Storage in Wind Turbine Towers: Design Considerations; Preprint.](#) September 2003; 12 pp. NREL/CP-500-34759.

Link, H.F.; Santos, R. [International Energy Agency Wind Turbine Round-Robin Test Task: Final Report.](#) March 2004; 41 pp. NREL/TP-500-35888.

Madsen, H.A.; Sorensen, N.N.; Schreck, S. **Yaw Aerodynamics Analyzed with Three Codes in Comparison with Experiment.** *Collection of the 2003 ASME Wind Energy Symposium Technical Papers at the 41st AIAA Aerospace Sciences Meeting and Exhibit, 6-9 January 2003, Reno, Nevada.* New York: American Institute of Aeronautics and Astronautics, Inc. (AIAA) and American Society of Mechanical Engineers (ASME), 2003; pp. 94-103.

Malcolm, D.J.; Hansen, A.C. [WindPACT Turbine Rotor Design, Specific Rating Study; Period of Performance: June 29, 2000—March 1, 2003.](#) November 2003; 42 pp. Work performed by Global Energy Concepts, LLC, Kirkland, Washington and Windward Engineering, Salt Lake City, Utah. NREL/SR-500-34794.

Migliore, P.; Oerlemans, S. [Wind Tunnel Aeroacoustic Tests of Six Airfoils for Use on Small Wind Turbines: Preprint.](#) December 2003; 18 pp. NREL/CP-500-35090.

Migliore, P.; van Dam, J.; Huskey, A. [Acoustic Tests of Small Wind Turbines: Preprint.](#) October 2003; 17 pp. NREL/CP-500-34662.

Milligan, M.; Schwartz, M.N.; Wan, Y. [Statistical Wind Power Forecasting for U.S. Wind Farms: Preprint](#). November 2003; 11 pp. NREL/CP-500-35087.

Moriarty, P.; Migliore, P. [Semi-Empirical Aeroacoustic Noise Prediction Code for Wind Turbines](#). December 2003; 39 pp. NREL/TP-500-34478.

Moriarty, P.J.; Holley, W.E.; Butterfield, S. **Probabilistic Methods for Predicting Wind Turbine Design Loads**. *Collection of the 2003 ASME Wind Energy Symposium Technical Papers at the 41st AIAA Aerospace Sciences Meeting and Exhibit, 6-9 January 2003, Reno, Nevada*. New York: American Institute of Aeronautics and Astronautics, Inc. (AIAA) and American Society of Mechanical Engineers (ASME), 2003; pp. 235-243.

Muljadi, E.; Bialasiewicz, J.T. [Hybrid Power System with a Controlled Energy Storage: Preprint](#). November 2003; 9 pp. NREL/CP-500-34692.

Muljadi, E.; Butterfield, C.P. **Dynamic Simulation of a Wind Farm with Variable Speed Wind Turbines**. *Journal of Solar Energy Engineering*. November 2003; 125: pp. 410-417.

Muljadi, E.; Butterfield, C.P. **Dynamic Simulation of a Wind Farm with Variable Speed Wind Turbines**. *Collection of the 2003 ASME Wind Energy Symposium Technical Papers at the 41st AIAA Aerospace Sciences Meeting and Exhibit, 6-9 January 2003, Reno, Nevada*. New York: American Institute of Aeronautics and Astronautics, Inc. (AIAA) and American Society of Mechanical Engineers (ASME), 2003; pp. 367-376.

Muljadi, E.; Butterfield, C.P.; Yinger, R.; Romanowitz, H. [Energy Storage and Reactive Power Compensator in a Large Wind Farm: Preprint](#). October 2003; 13 pp. NREL/CP-500-34701.

Musial, W.; Butterfield, S.; Boone, A. [Feasibility of Floating Platform Systems for Wind Turbines: Preprint](#). November 2003; 14 pp. NREL/CP-500-34874.

Schreck, S.; Robinson, M. **Structures and Interactions Underlying Rotational Augmentation of Blade Aerodynamic Response**. *Collection of the 2003 ASME Wind Energy Symposium Technical Papers at the 41st AIAA Aerospace Sciences Meeting and Exhibit, 6-9 January 2003, Reno, Nevada*. New York: American Institute of Aeronautics and Astronautics, Inc. (AIAA) and American Society of Mechanical Engineers (ASME), 2003; pp. 104-114.

Schreck, S.J.; Robinson, M.C. **Blade Three-Dimensional Dynamic Stall Response to Wind Turbine Operating Condition.** (FEDSM2003-45362). Ogut, A.; Tsuji, Y., and Kawahashi, M., eds. *Proceedings of ASME FEDSM'03 4th ASME/JSME Joint Fluids Engineering Conference, 6-10 July 2003, Honolulu, Hawaii*. New York: The American Society of Mechanical Engineers (ASME), 2003; Vol. 2D: pp. 2575-2584.

Sinclair, K.; Milligan, M.; Goldberg, M. [Job and Economic Development Impact \(JEDI\) Model: A User-Friendly Tool to Calculate Economic Impacts from Wind Projects; Preprint.](#) March 2004; 12 pp. NREL/CP-500-35953.

Smith, J.C.; DeMeo, E.A.; Parsons, B.; Milligan, M. [Wind Power Impacts on Electric Power System Operating Costs: Summary and Perspective on Work to Date; Preprint.](#) March 2004; 13 pp. NREL/CP-500-35946.

Stol, K.A. **Disturbance Tracking and Blade Load Control of Wind Turbines in Variable-Speed Operation.** *Collection of the 2003 ASME Wind Energy Symposium Technical Papers at the 41st AIAA Aerospace Sciences Meeting and Exhibit, 6-9 January 2003, Reno, Nevada*. New York: American Institute of Aeronautics and Astronautics, Inc. (AIAA) and American Society of Mechanical Engineers (ASME), 2003; pp. 317-323.

Stol, K.A. **Disturbance Tracking Control and Blade Load Mitigation for Variable-Speed Wind Turbines.** *Journal of Solar Energy Engineering. Transactions of the ASME*. November 2003; 125(4): pp. 396-401.

Stol, K.A. **Time-Varying Control of Wind Turbines.** *Proceedings of the American Control Conference, 4-6 June 2003, Denver, Colorado*. Piscataway, NJ: Institute of Electrical and Electronics Engineers, Inc. (IEEE), 2003; p. 3796.

Stol, K.A.; Balas, M.J. **Periodic Disturbance Accommodating Control for Blade Load Mitigation in Wind Turbines.** *Journal of Solar Energy Engineering. Transactions of the ASME*. November 2003; 125(4): pp. 379-385.

Sutherland, H.J.; Kelley, N.D.; Hand, M.M. **Inflow and Fatigue Response of the NWTC Advanced Research Turbine.** *Collection of the 2003 ASME Wind Energy Symposium Technical Papers at the 41st AIAA Aerospace Sciences Meeting and Exhibit, 6-9 January 2003, Reno, Nevada*. New York: American Institute of Aeronautics and Astronautics, Inc. (AIAA) and American Society of Mechanical Engineers (ASME), 2003; pp. 214-224.

Tangler, J.; Bir, G. [Evaluation of RCAS Inflow Models for Wind Turbine Analysis.](#) February 2004; 42 pp. NREL/TP-500-35109.

Thelander, C.G.; Smallwood, K.S.; Rugge, L. [Bird Risk Behaviors and Fatalities at the Altamont Pass Wind Resource Area: Period of Performance, March 1998—December 2000.](#) December 2003; 92 pp. NREL/SR-500-33829.

van Dam, J.; Meadors, M.; Link, H.; Migliore, P. [Power Performance Test Report for the Southwest Windpower AIR-X Wind Turbine](#). September 2003; 21 pp. NREL/TP-500-34756.

Veers, P.S.; Ashwill, T.D.; Sutherland, H.J.; Laird, D.L.; Lobitz, D.W.; Griffin, D.A.; Mandell, J.F.; Musial, W.D.; Jackson, K.; Zuteck, M.; Miravete, A.; Tsai, S.W.; Richmond, J.L. **Trends in the Design, Manufacture and Evaluation of Wind Turbine Blades**. *Wind Energy*. 2003; 6: pp. 245-259.

Wan, Y.; Milligan, M.; Parsons, B. **Output Power Correlation Between Adjacent Wind Power Plants**. *Journal of Solar Energy Engineering. Transactions of the ASME*. November 2003; 125(4): pp. 551-555.

Wan, Y.; Parsons, B.; Milligan, M. **Output Power Correlation Between Nearby Wind Power Plants**. *Collection of the 2003 ASME Wind Energy Symposium Technical Papers at the 41st AIAA Aerospace Sciences Meeting and Exhibit, 6-9 January 2003, Reno, Nevada*. New York: American Institute of Aeronautics and Astronautics, Inc. (AIAA) and American Society of Mechanical Engineers (ASME), 2003; pp. 351-356.

White, D.L.; Musial, W.D. [Effect of Load Phase Angle on Wind Turbine Blade Fatigue Damage: Preprint](#). November 2003; 12 pp. NREL/CP-500-34837.

White, D.L.; Musial, W.D. **Efficient Method for Fatigue Testing Multi-Megawatt Composite Wind Turbine Blades Using Resonant Excitation**. Cohen, L.J.; Ong, C.L., and Arendt, C., eds. *Advancing Materials in the Global Economy: Applications, Emerging Markets and Evolving Technologies*. Proceedings of the 48th International SAMPE Symposium and Exhibition, 11-15 May 2003, Long Beach, California. Covina, CA: Society for the Advancement of Material and Process Engineering (SAMPE), 2003; pp. 2667-2679.

Wright, A.D.; Balas, M.J. [Design of Controls to Attenuate Loads in the Controls Advanced Research Turbine: Preprint](#). November 2003; 14 pp. NREL/CP-500-35084.

Wright, A.D.; Balas, M.J. **Design of Modern Controls for the Controlled Advanced Research Turbine (CART)**. *Collection of the 2003 ASME Wind Energy Symposium Technical Papers at the 41st AIAA Aerospace Sciences Meeting and Exhibit, 6-9 January 2003, Reno, Nevada*. New York: American Institute of Aeronautics and Astronautics, Inc. (AIAA) and American Society of Mechanical Engineers (ASME), 2003; pp. 304-316.